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CALCIUM FRACTIONS IN INFANTILE SPASMOPHILIA

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It is evident that blood calcium may be found under different conditions and in various combinations. This fact has been expressed in several ways, one of the most common being by the use of the classification "diffusible calcium" and "nondiffusible calcium." It must, nevertheless, be kept in mind that this simple classification is far from giving an exact idea of the complexity of the question. Hess [1] has said that calcium may be found in the blood in at least four states: two diffusible and two nondiffusible. Of the diffusible portion, two thirds is an absorbable calcium-phosphorus compound, the rest being ionized calcium. About one fourth of the nondiffusible fraction is absorbable by dry barium sulfate (40 per cent solution), and the remaining three fourths is accepted by Hess as being in combination with the serum protein.

For the time being we have adopted the designations of diffusible calcium and nondiffusible calcium, determining the first by the concentration of calcium in the spinal fluid (which from now on we shall refer to as spinal fluid calcium) and the second by deducting from the blood calcium (total calcium) the spinal fluid calcium. As we did not find data in the literature regarding normal calcium levels for infants, we investigated this point carefully in 10 cases with the following results: diffusible calcium, 6.30 per cent, and nondiffusible calcium, 5.21 per cent. In most of the cases the diffusible calcium was more than 50 per cent of the total calcium, which would seem to show that the diffusible calcium is higher in infants than in older children.[2] In the light of previous investigations, we consider that our infants have a higher normal concen-

1. Hess, A.: Collected Writings, Springfield, Ill., Charles C. Thomas, Publisher, 1936, vol. 3, p. 356.

2. Garrahan, J. P., and Thomas, G. F.: Calcio difusible y no difusible, Arch. argent. de pediat. **1**:294, 1937.

tration of calcium in the blood: from 10 to 12 mg. per hundred cubic centimeters of blood.[3]

Cantarow,[4] Cameron and Moorhouse [5] and others have expressed the opinion that the spinal fluid calcium is the equivalent of the diffusible calcium of the serum (from the results of such work as simultaneous determinations of diffusible calcium by ultrafiltration and concentration of spinal fluid calcium). The two last-named authors went so far as to say that the walls of the capillaries of the choroid plexus are more perfect dialyzing membranes than those used in laboratory technics. Nevertheless, this assertion has been questioned within the past few years, and we find contradictory opinions in the literature, the majority of which are against accepting this point of view without reservations. Cameron and Moorhouse,[6] after a series of investigations, ended by saying that the spinal fluid calcium represents the diffusible calcium portion of the serum in patients with normal concentration of calcium in the blood but not in those whose concentration of blood calcium is altered. However, it is of interest to the clinician, and even to the research worker, to continue the study of the relation of blood calcium and spinal fluid calcium, for it may have unexpected implications with regard to diagnosis and treatment.

In this paper we propose to contribute our experience on the determination of calcium levels in spasmophilia, a point about which there is much discussion.

It is well known that hypocalcemia is a fundamental sign of spasmophilia, and it has been said that when the blood calcium falls below 7 mg. per hundred cubic centimeters of serum, the disturbance, until then latent, becomes active in most cases. But it is also true that this does not always occur, for it is known that other diseases, such as nephrosis, kala-azar and infantile constitutional eczema, are accompanied by hypocalcemia, which is in some cases even marked. We had occasion to see a baby with constitutional eczema and marked dystrophy and hydrolability, who at the age of 8 months had 7.4 per cent of blood calcium and only 1.5 per cent of nondiffusible calcium, without at any time showing signs of spasmophilia clinically or on electric stimulation. In this instance there was a decrease of the serum proteins, as is seen in nephrosis.

The qualitative determinations of calcium are important, therefore, from a pathogenic standpoint. It has been said that the nondiffusible portion is reduced when the amount of serum protein is low (classic

3. Garrahan, J. P.; Thomas, G. F., and Ferro, H.: La calcemia en los prematuros, Arch. argent. de pediat. **1**:141, 1936.

4. Cantarow, A.: Calcium Metabolism and Calcium Therapy, Philadelphia, Lea & Febiger, 1933, p. 39.

5. Cited by Cantarow,[4] p. 41.

6. Cameron, A. T., and Moorhouse, V. H. K.: The Relation Between Plasma and Spinal Fluid Calcium, J. Physiol. **91**:90, 1937.

example, nephrosis) and that in spasmophilia it is the ionized calcium—a portion of the diffusible calcium—which is lowered. In accordance with the foregoing thesis, it was established that the hypocalcemia of the infants who suffer from this condition was produced at the expense of the diffusible calcium. Pinkus, Petersen and Kramer,[7] by ultrafiltration methods, have found in infantile spasmophilia and parathyroid tetany that only the diffusible calcium is low. Gunther and Greeberger [7] established that when the diffusible calcium was below 3.5 per cent the patient showed signs of active tetany. On the other hand, Liu [7] found both portions lowered, although to a greater extent in the diffusible fraction. Liu worked with cases of chronic juvenile and adult tetany. Other workers studying experimental tetany in dogs found a decrease in both fractions (von Meysenbug [7] and MacCann and Moritz [7]). These references given by Cantarow [8] in 1933 are followed by contradictory opinions based on clinical and experimental data. Cameron and Moorhouse, Cruickshank, Morgulis and Perley, Merrit and Bauer, Zainal, Bendien and Snapper and Leicher [7] found the nondiffusible calcium essentially lowered. Siwe,[9] in a short series of cases, was able to show that the changes of the spinal fluid calcium do not follow exactly those of the blood calcium and that the spinal fluid calcium was higher in active tetany than in latent tetany.

What we have said before shows that there is as yet no agreement in regard to the changes in the calcium fractions in infantile spasmophilia, although recent investigations reveal a tendency to accept the fact that the nondiffusible calcium portion is decreased in greater proportion. As stated before, it is by no means unanimously accepted that the spinal fluid calcium is equivalent to the blood diffusible calcium, for there is evidence against this theory. That the choroid plexuses are physiologic dialyzers has also been questioned. It would appear that the concentration of the spinal fluid calcium merits semeiologic study, although it has not been possible as yet to establish with accuracy its diagnostic value.

We have made numerous and careful simultaneous determinations of calcium in the blood and spinal fluid (Clark and Collip's method, modified by Kramer and Tisdall) of healthy and sick infants. In this paper we shall report our results in 6 cases of spasmophilia, the diagnosis of which has been based on clinical and chemical examinations and on electric stimulation. The patients were seen in the children's section (in charge of Prof. J. P. Garrahan) of the Instituto de Maternidad (Prof. A. Peralta Ramos).

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7. Cited by Cantarow,[4] p. 91.

8. Cantarow,[4] pp. 91-92.

9. Siwe, S.: Rickets and Spasmophilia: II. The Changes in the Spinal Fluid in Tetany, Acta pædiat. **17**:157, 1934; abstracted, Am. J. Dis. Child. **51**:146 (Jan.) 1936.

REPORT OF CASES

CASE 1.—A. R., aged 7 months and 20 days at the time of the first calcium determination, artificially fed from birth, had a probable history of syphilis. The child had been deficiently cared for, was dystrophic and had suffered repeated clonic and tonic convulsive attacks. There were no signs of mechanical hyperexcitability of the nerves. On admission electric stimulation elicited both Erb's and Thiemmich and Mann's reactions: negative cathode, 0.6 milliamperes; positive cathode, 0.8 milliamperes; positive anode, 0.8 milliamperes, and negative anode, 2 milliamperes (Dr. Muzio). The baby did well with proper feeding, hygienic care and daily dosage for more than one month with 10,000 international units of vitamin D. The successive calcium determinations were as follows:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio $\frac{\text{SFCa}}{\text{Blood Ca}}$
9/25	7.0	4.8	2.2	68.5%
10/ 2	8.7	6.0	2.7	68.9%
10/ 9	9.8	5.5	4.3	56.1%
10/18	10.7	5.6	5.1	52.3%

CASE 2.—B. R., aged 2 months at the time of the first calcium determination, artificially fed from birth, at 1 month of age had had an acute infection, with great loss of weight and toxic symptoms. The child had done well on buttermilk feedings and occasional blood transfusions. At 2 months of age the infant had tonic and clonic convulsions, and the blood calcium was found to be low. There was no Chvostek sign. Results of the electric stimulation (Thiemmich and Mann) were: negative cathode, 2.5 milliamperes; positive cathode, 3 milliamperes; positive anode, 4 milliamperes, and negative anode, 4.9 milliamperes (Dr. Muzio). The child was treated with vitamin D and two injections of 50 units of parathyroid extract. Progress was definitely favorable, and two months later his nutritional development was much more satisfactory and the result of electric stimulation was negative. The calcium data of the patient were as follows:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio $\frac{\text{SFCa}}{\text{Blood Ca}}$
6/18	7.9	6.5	1.4	82.2%
6/23	7.7	6.2	1.5	80.5%
6/30	8.5	5.9	2.6	69.4%
7/16	9.3	6.3	3.0	67.7%
7/25	10.0	5.9	4.1	59.0%
8/ 4	10.3	6.3	4.0	61.1%

When we considered this baby as actually cured of spasmophilia, the ratio was still high, but we have observed the same phenomenon in healthy infants (ratio well above 50 per cent).

CASE 3.—A. E., aged 1 month and 10 days at the time of the first calcium determination, artificially fed, had had repeated convulsions accompanied by cyanosis. There were muscular hypertonicity, a strongly positive Chvostek and a positive peroneal sign. The child was given vitamin D, but died at the age of 2½ months of an infectious process. The calcium findings were as follows:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio $\frac{\text{SFCa}}{\text{Blood Ca}}$
7/21	7.3	6.4	0.9	87.7%
7/23	8.6	7.1	1.5	82.6%

CASE 4.—P. S., aged 2½ months, was breast fed during his first weeks, then given mixed feeding. He had suffered from laryngospasm. There were a negative Chvostek sign and a low blood calcium. The child did not return for a follow-up examination. The calcium data were as follows:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio	SFCa / Blood Ca
7/16	7.4	5.5	1.9	74.3%	

CASE 5.—A. B., aged 3 months on the day of the first calcium determination, was admitted to the hospital for an acute pulmonary process, which had begun one week before. The infant died two days after admission. There were convulsions and marked hypertonicity of the extremities. Three weeks before the onset of the final illness, the baby, while in good health, had had convulsions. The child had been seen in another hospital and had had spinal fluid removed, which on examination had proved negative. The calcium data follow:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio	SFCa / Blood Ca
8/16	7.6	5.6	2.0	73.6%	

CASE 6.—The patient was aged 14 months and 15 days on the day of the calcium determination. Weight at birth was 2,800 Gm. The family history was unimportant. The infant, breast fed until 6 months of age, had then been put on a well regulated regimen consisting partly of breast feedings and partly artificial feedings. The mother stated that the baby had spent much time out of doors. The child had had convulsions three months before the present admission for a "grip" infection with convulsive initiation. The weight was 8,900 Gm., the height 70 cm. and nutritional development good. Although the child could stand at 1 year of age, it had not started walking. The anterior fontanel was large (5 by 5 cm.); there were two incisors. A costal rosary was present, but there was no enlargement of the spleen or liver. A positive Chvostek sign (more pronounced for the upper portion of the face) and a negative Trousseau sign were elicited. Electric stimulation showed a positive Thiemmich and Mann reaction to the negative anode at 4 milliamperes (Dr. Muzio). Roentgenograms of the wrists showed rachitic lesions. The inorganic phosphorus content was 5.5 mg. per hundred cubic centimeters of blood; the blood phosphatase (Bodansky units), 12 mg., and the blood calcium, 6.7 mg.

The calcium data follow:

Date	Blood Calcium	Spinal Fluid Calcium or Diffusible Calcium	Nondiffusible Calcium	Ratio	SFCa / Blood Ca
8/7	6.7	6.0	0.7	89.5%	

COMMENT

Our observations allow us to state that in infantile spasmophilia the diffusible calcium remains at normal levels, sometimes above normal, while the nondiffusible calcium is greatly reduced (between 2.2 and 0.7). We have seen also that as the condition progresses toward healing, the nondiffusible calcium increases and the diffusible calcium remains the same or shows slight increases. In case 2 we observed twice that six

hours after the injection of 50 units of parathyroid extract the nondiffusible calcium was elevated to normal levels (the total, or blood, calcium also rose) and the diffusible calcium was slightly decreased. Twenty-four hours after the injection both fractions were back to the same point as before the administration of parathyroid extract. This carefully studied case enables us to assert that the extract, while normalizing for a short period the lowered concentration of calcium in the blood of a person with spasmophilia, raises the nondiffusible calcium and modifies the diffusible portion. Gilligan, Volk and Altschule [10] stated that parathyroid extract does not modify in the same degree the curves of diffusible calcium (ultrafiltration) and of spinal fluid calcium. The latter is altered in a lesser degree. This happened in our case.

We regard the calcium in the spinal fluid calcium as diffusible calcium, although we are not absolutely certain that it represents the diffusible fraction of the blood calcium. Nevertheless, we feel that, on the basis of the 6 observations reported, we can say that the spinal fluid calcium is little or not at all altered quantitatively in infants with spasmophilia.

It is without doubt strange that in the disease in question the spinal fluid calcium is not affected, seeing that it is believed to include the ionized calcium. According to Cantarow and Moritz,[11] the injection of parathyroid extract increases both fractions, as we noted in an experiment in a normal infant. It is possible that what Salvesen and Linder [11] suspected occurs, namely, that with an initial decrease in the diffusible portion of the blood calcium part of the nondiffusible portion becomes diffusible and that to keep both fractions in equilibrium it is necessary that the spinal fluid calcium be higher than the expected level for the diffusible calcium in the blood.

It does not seem logical to believe that the reduction of the nondiffusible calcium favors the appearance of spasmophilic symptoms. This reduction is observed in cases of nephrosis and eczema due to hypoproteinemia, without the occurrence of spasmophilia. The view of Cantarow, who stated that spasmophilia is related to the decrease of the ionized calcium, is probably correct. This decrease is not always shown in the changes of both calcium fractions. We would add that the same occurs in the so-called "gastric tetany," in which the level of blood calcium is normal and the suspected reduction of the ionized calcium is believed to be responsible for the condition.

Evidently, everything related to calcium fractions and ionized calcium demands further investigation. We believe that our data show that

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10. Gilligan, D. R.; Volk, M. C., and Altschule, M. D.: The Diffusibility of Plasma Calcium Following Parathormone Administration, J. Biol. Chem. **103**:745 (Dec.) 1933.

11. Cantarow,[4] p. 93.

changes (apparent) in the spinal fluid calcium of infants with spasmophilia are unimportant or may be absent.

SUMMARY

Six cases of infantile spasmophilia are reported, in which the determinations of calcium in the blood and spinal fluid were carefully studied. Bibliographic data on calcium fractions (value of the spinal fluid calcium as representing the diffusible calcium of the blood) and on quantitative changes of the same in infantile spasmophilia are reviewed. Our personal investigations include data on blood calcium and calcium fractions and the response to the administration of parathyroid extract in healthy and sick children.

On the basis of our study, we conclude that in infants affected with spasmophilia the calcium of the spinal fluid does not show marked quantitative changes.

PNEUMOCOCCUS TYPING IN CASES OF PNEUMONIA IN INFANTS AND IN CHILDREN

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In spite of the introduction of chemotherapeutic agents for the treatment of the pneumococcic pneumonias, it is still important for a physician to know the type of pneumococcus infecting his patient. For several reasons this knowledge is important not only in prognosis but in treatment: The specific immunity responses which are essential adjuvants to chemotherapeusis are sometimes lacking and must be supplied; pneuomococci may become sulfanilamide fast or sulfapyridine fast, and other conditions may be present or develop when serotherapy is mandatory.

Practicing physicians often deplore their inability to obtain sputum from infants and children.[1] Various methods which depend on the collection of what is coughed out and swallowed or of what clings to the respiratory passages or esophagus have been advocated for obtaining pulmonary mucus. Three such methods are here described:

Pharyngeal Swab.—To obtain a pharyngeal swab, the child is gagged with a tongue depressor and made to cough. Regurgitated pulmonary mucus is then caught on a cotton-tipped applicator, or the mucus in the pharynx is collected by brushing the pharynx. Typing is directly done by the Neufeld technic on the mucus from the swab, or the swab may be placed in a tube containing 3 cc. of beef heart infusion broth (p_H 7.4 to 7.8) which contains 0.5 cc. of citrated rabbit's blood. The broth is incubated for three hours, or until a uniform cloudiness appears.

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1. Hirschberg, N.: Sputum Typing in Pneumonia in Infants, Arch. Pediat. **55:** 521-525 (Sept.) 1938.

The organism present may be typed directly or after centrifugation. If the broth is incubated too long, the uniform haziness changes to a granular appearance; this indicates an overgrowth of streptococci or other organisms. If no organism suitable for typing is obtained from the broth, 0.5 cc. of the broth culture should be injected into the peritoneum of a mouse. In from four to eight hours, peritoneal fluid may be removed with a glass capillary, and typing may be attempted.

Laryngeal Swab.—Pharyngeal swabs are less satisfactory than swabs of material taken directly from the larynx. The epiglottis must be elevated so as to expose the false cords and the arytenoid cartilages. This may be accomplished with a tongue depressor, a bright light and a headmirror, but a Flagg laryngoscope augments deftness and ease. Pulmonary mucus directly discharged through the glottis may be caught on a cotton-wrapped applicator and the organism obtained from it directly typed, or it may be placed in broth, or the mucus clinging to the arytenoid cartilages may be collected.[2]

Aspiration of the Gastric Contents.—Because swallowed mucus is not promptly digested in acid gastric juice, aspiration of the gastric contents is a useful method of obtaining pulmonary mucus. This may be accomplished with a catheter attached to a 20 cc. syringe, as described by Wittes and Bullowa.[3]

VACUUM EXTRACTION METHOD

Mucus regurgitated from the stomach, clinging to the pharynx or larynx or directly coughed onto the tube may be collected by aspiration from the pharynx or larynx with the instrument described in the next paragraph and shown in the accompanying illustration. This method has been used at the Harlem hospital and in the Newark department of health for obtaining pulmonary mucus from infants, children and non-cooperative adults.

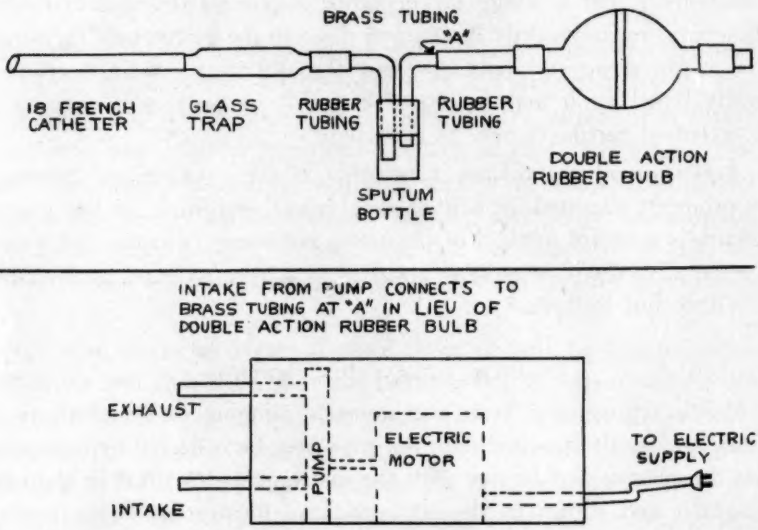
The apparatus consists of a no. 18 French rubber catheter with an opening at the end. The catheter is attached to a fire-polished and annealed pyrex glass trap about 4 inches (10.16 cm.) long. From the glass trap through pressure rubber tubing, the catheter is attached by brass tubing to a sputum bottle stoppered with a no. 5 rubber stopper containing two holes. The outlet from the sputum bottle, also of brass,

2. Vinograd, J.; Nemir, R. L., and Park, W. H.: Rapid Typing of Pneumococci by the Neufeld Reaction Directly from Laryngeal Swabs from Infants and Children, Am. J. Dis. Child. **51**:792-800 (April) 1936.

3. Wittes, S. A., and Bullowa, J. G. M.: Gastric Aspiration in Children with Pneumonia to Obtain Material for Pneumococcus Typing, Am. J. Dis. Child. **50**: 1404-1407 (Dec.) 1935.

leads to a double action rubber bulb or to an electric suction pump. The pump is of the rotary compressor type, operated by a 1/30 horse power universal motor.

During any of these manipulations the child should be properly restrained with a "mummy bandage," that is, in a folded sheet which pinions the arms separately to the sides, with the hands flat against the buttocks. The wrapping is done as follows: The top of the folded sheet is at the insertion of the deltoid muscles. The patient is placed on the sheet, and the end of the sheet restraining one upper extremity is passed over and around the body, separating the other extremity from the trunk. The other free end is then brought forward and fastened



The pharyngeal evacuator used by the Harlem Hospital and the Newark department of health for obtaining pulmonary mucus by the vacuum extraction method.

with a safety pin on the side of the first extremity at the deltoid level. The second safety pin is placed at the wrist level. A third may be used above the ankles. With the patient's arms and trunk thus restrained, the head may be steadied with the hands of the nurse while she controls the trunk with her elbow.[4]

Coughing is induced with the tongue depressor or the catheter, and the pulmonary secretion is aspirated through the glass trap into the attached sputum bottle. The whole procedure should take but a few seconds; otherwise the throat structures may be injured and the patient

4. Bullowa, J. G. M.: The Management of the Pneumonias, New York, Oxford University Press, 1937.

exhausted. After the sputum appears in the glass trap, it may be blown with the bulb or the pump into the bottle and sent for examination.

Comment.—This method of obtaining pulmonary mucus was applied in the cases of 100 patients suffering from pneumonia. The pneumococcus was obtained directly from the aspirated mucus in 72 cases by Neufeld, or direct, typing; in 17 instances the type was obtained from the mouse peritoneum; in 6, from the brain culture of the same mouse. In only 5 cases was no pneumococcus obtained; that is, in 95 of the 100 cases a pneumococcus which could be typed was obtained from the aspirate. In 11 cases a pharyngeal swabbing had been performed

TABLE 1.—*Cases of Pneumonia in Which Two Evacuates Were Necessary for the Typing of the Pneumococcus*

Character of Pneumonia							
Lobar				Bronchial			
Method of Obtaining Pneumococcus							
Direct		Mouse		Direct		Mouse	
Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus
Chuldren Under 2 Years of Age							
1	XIV	1	III	.....	.....	.....	.....
..	.....	1	XIV	.....	.....	.....	.....
..	.....	1	XXIII	.....	.....	.....	.....
Children Aged 2 to 12 Years							
1	XIV	1	XXI	.....	.....	.....	.....
..	.....	1	I & XXI	.....	.....	.....	.....
Total number of cases..... 7							

prior to the pharyngeal evacuation; in 4 of these cases a pneumococcus that could be typed was found in the evacuate, whereas the previous attempts at typing made with a pharyngeal swab had failed. In the remaining 7 cases, the type was ascertained sooner from the evacuate than from the material of the swab. A type was obtained directly from the evacuate in some cases in which, when the swab was used, a type was obtained only from the mouse peritoneum or the mouse brain. A second aspiration was necessary in 7 cases (table 1). There were 5 instances of bacteremia. The types found, the ages of the patients, the characters of the pneumonias and the procedure necessary for typing the mucus evacuated, are shown in table 2. These data are in accord with previous experience, pneumococcus XIV occurring most frequently in infants and pneumococcus I most frequently in older children.

TABLE 2.—*Typing of the Pneumococci Obtained from the Evacuate in 95 of the 100 Cases in Which Such Typing Was Attempted*

Character of Pneumonia							
Lobar				Bronchial			
Method of Obtaining Pneumococcus							
Direct		Mouse		Direct		Mouse	
Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus	Number of Cases	Type of Pneumococcus
Children Under 6 Months of Age							
1	V	1	XIV	1	V	1	XXIII
1	VI	1	XIX	1	X & XXIX	..	.....
1	XIV	..	.....	.	.....	..	.....
1	XXIV	..	.....	..	.....	..	.....
Children from 6 Months to 1 Year of Age							
1	IV	1	IV	1	VI	..	.....
1	IX	1	XIV*	1	V & XXI	..	.....
9	XIV (2*)	..	.....	1	Wilder †	..	.....
				1	XIV	..	.....
1	XVIII	..	.....	..	.....	..	.....
Children 1 to 2 Years of Age							
1	III	2	XIV	1	III	1	VI & XXI
1	IV & VI	1	XXIII	2	XIX	1	VII
7	XIV	..	.....	..	.....	..	.....
1	XX	..	.....	..	.....	..	.....
Children 2 to 12 Years of Age							
7	I	1	IV	1	I	1	I
2	III	1	IV & XVI	1	Wilder †	2	III
1	I & VIII	1	XIV	..	.....	1	IV
1	I & XXI	1	XV	..	.....	1	VI
1	IV & V	1	XVIII	..	.....	1	XIV
1	XIV & VII	..	.....	..	.....	1	XVIII
6	V(1*)	..	.....	..	.....	..	.....
1	VI	..	.....	..	.....	..	.....
1	VI & VII	..	...	.	.....	..	.....
1	VIII	..	....	..	.....	..	.....
1	Wilder †	..	.....	..	.....	..	.....
1	XIII	..	.....	..	.....	..	.....
7	XIV	..	.....	..	.....	..	.....
1	XVIII	..	.....	..	.....	..	.....
1	XIX	..	....	.	.....	..	.....
1	XXII	..	.....	..	.....	..	.....
Patients Over 12 Years of Age							
1	V (1*)	..	.....	..	.....	..	.....
Total number of cases.....							95

* Bacteremia.
† Pneumococcus type XXXIII.

TABLE 3.—*The 5 Remaining Cases, in Which the Evacuates Did Not Yield Pneumococci That Could Be Typed*

Type of Pneumonia		
	Lobar	Bronchial
Children under 6 Months of Age	1	1
From 6 Months to 1 Year of Age	1	..
1 to 2 Years of Age	..	..
2 to 12 Years	2	..
Over 12 Years	..	..
Total number of cases.....		5

SUMMARY

With the method of pharyngeal evacuation applied to a mummied infant and accomplished by the use of a suction bulb with catheter and trap, pulmonary mucus obtained for typing pneumococci gave a type in 95 per cent of cases. The portable apparatus for evacuation is simple to prepare and use.

Dr. Morris A. Gleich, director of pediatrics at Harlem Hospital, granted permission for this study to be made in his wards. Dr. Charles V. Craster, Health Officer of the Newark Department of Health, offered encouragement as well as valuable opportunities. The study was made while Dr. Simon was a graduate student in the course on pneumonia given at Harlem Hospital by the New York University College of Medicine.

TREATMENT OF MEGACOLON WITH ACETYLBETA-METHYLCHOLINE BROMIDE

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It is recognized that megacolon is an uncommon disease; that the exact etiology is not known, though probably it is caused by an imbalance of the autonomic nerve supply to the colon, and that there had been no really satisfactory method of treatment up to twelve years ago.

The successful results of R. B. Wade's operation, on May 26, 1926, left lumbar sympathetic ramisection on a 10 year old boy suffering from megacolon, led to further trial and confirmation of the value of interruption of the sympathetic nerves to the colon.[1] Technical and anatomic modifications of interruption of the sympathetic nerves by Judd and Adson and Rankin and Learmonth have given good results.[2] Therapeutic management of megacolon, previously stalemated, is now successful in the majority of those operated on. Operation, however, does not immediately restore the normal functional activity of the bowel. It is usually necessary to enlist the aid of enemas, liquid petrolatum or laxatives for from one week to many weeks before the habit of spontaneous evacuation is established. Intractable relapses not infrequently occur, and some of these patients die from acute intestinal obstruction secondary to extreme distention and kinking of the bowel. Sympathectomy has not, therefore, entirely solved the therapeutic problem.

The clinical success of interruption of the sympathetic nerves and certain experimental evidence support the belief in the neurogenic origin of megacolon. Various neurogenic theories of causation have accordingly received renewed attention. Notable among these is Hurst's opinion of the absence of relaxation of the sphincter ani when the normal colonic peristalsis reaches the rectum, caused by a diminished tonus of the sacral parasympathetic nervous system.[3]

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1. Bartle, J. H.: Am. J. M. Sc. **171**:67, 1926. Wade, R. B., and Royle, N. D.: M. J. Australia **1**:137, 1927. Royle, N. D.: Proc. Roy. Soc. Med. (Sect. Orthop.) **20**:63, 1927.

2. Judd, E. S., and Adson, A. W.: Ann. Surg. **88**:479, 1928. Rankin, F. W., and Learmonth, J. R.: Am. J. Surg. **15**:219, 1932. Learmonth, J. R.: Brit. M. J. **2**:154, 1937.

3. Hurst, A. F.: Constipation and Allied Intestinal Disorders, ed. 2, London, Oxford University Press, 1919, chap. 1; Guy's Hosp. Rep. **84**:317, 1934.

Hurst's theory indicates an autonomic imbalance and not a failure of contractile power of the bowel. Adequate proof of dysfunction rather than paresis is usually demonstrable in the vigorous peristalsis in these patients, as evidenced by prominent colonic peristaltic patterns.

PHYSIOLOGIC DYSFUNCTION IN RELATION TO AUTONOMIC NERVE SUPPLY

Knowledge of the functions of the autonomic nervous system in man is imperfect. Much is assumed from experimental proof gained from lower vertebrates. There is incomplete and conflicting evidence concerning the anatomic distribution of sympathetic and parasympathetic nerves to the abdominal viscera. Accepted common knowledge of the functional mechanism and innervation of the colon follows:[4]

Peristalsis is a coordinated neuromuscular activity, the stimuli of which are mechanical and chemical, issuing from food conveyed in the intestine. Integrating and subserving peristaltic function are Auerbach's and Meissner's intrinsic muscle plexuses and the extrinsic innervation of the intestine from the parasympathetic (sacral autonomic) nerves and the sympathetic (lumbar autonomic) nerves. The distal portion of the colon is innervated by the sympathetic nerves coming from the spinal cord at the first and second lumbar segments, passing through the lumbar sympathetic ganglionated trunk and the lumbar splanchnic nerves to the inferior mesenteric and hypogastric plexuses. The sympathetic nerves also supply circular muscle fibers of the rectum. Stimulation of the sympathetic nerves causes inhibition of peristalsis and tightens the internal anal sphincter. The parasympathetic innervation to the distal portion of the colon proceeds from the cord through the lower sacral segments and travels toward the inferior mesenteric artery. The longitudinal muscle fibers of the rectum are also supplied by the parasympathetic nerves. Stimulation of the parasympathetic nerves increases the tone of the intestine, renders its movements more active and relaxes the internal sphincter.

The beneficial results of sympathectomy in megacolon are primarily explained as due to blocking out of sympathetic stimuli (inhibitors to the colon). They are probably not due to any subsequent increase in activity of the parasympathetic nerves on the colon.

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4. Gaskell, W. H.: The Involuntary Nervous System, London, Longmans, Green & Co., 1916. Gask, G. E., and Ross, J. P.: The Surgery of the Sympathetic Nervous System, Baltimore, William Wood & Company, 1937. Kuntz, A.: The Autonomic Nervous System, ed. 2, Philadelphia, Lea & Febiger, 1935. Bayliss, W. M., and Starling, E. H.: J. Physiol. **24**:99, 1899. Trumble, H. C.: Brit. J. Surg. **23**:214, 1935. Ranson, S. W.: The Anatomy of the Nervous System, ed. 5, Philadelphia, W. B. Saunders Company, 1935, chap. 21.

Two etiologic hypotheses are possible in the neurogenic theory of origin of megacolon: The excess sympathetic activity (afferent impulses) may produce constipation or a diminished tonus of the parasympathetic innervation of the colon, and its associated inefficient relaxation of the sphincter may disturb the physiologic equilibrium.

It is difficult to demonstrate clinically overactivity of the sympathetic nerves. Spinal anesthesia can be used as a test, but this may block the parasympathetic as well as the sympathetic nerves and the interpretation is, therefore, equivocal.[5] Diminished parasympathetic tonus cannot be clinically demonstrated except by the use of cholinergic drugs. The decision for sympathectomy is empiric in most instances.

Wade observed that patients who showed hypertrophy of the colon and visible peristalsis did well with operation. When hypertrophy was absent improvement was minimal. In those in whom hypertrophy of the colon had progressed to marked dilatation, with a thin weak musculature, the results after operation were unsatisfactory. These patients were in constant danger of great distention and kinking of the bowel and subsequently required frequent enemas.

Sympathectomy is a distinctive therapeutic agent with three limiting factors: 1. Children below the age of 4 stand the operation poorly with minimal benefits. 2. Children with marked colonic dilatation and a thin weak musculature are not apt to react successfully to sympathectomy. 3. There is no dependable diagnostic test to prognosticate successful results.

Physiologic demonstrations show that stimulation of the sympathetic or parasympathetic nerves affects the colon and sphincters as a functional unit. It is known that stimulation of the parasympathetic nerves contracts the colon, relaxes the internal sphincter and leads to evacuation. Consequently, the employment of a neurogenic drug to stimulate the parasympathetic nerves is a logical therapeutic approach.

ACTION OF CHOLINERGIC DRUGS ON THE GASTROINTESTINAL TRACT

The production of cholinergic drugs which may be used therapeutically is the outgrowth of researches to discover chemical substances by means of which the autonomic nervous system activates tissues. Weiland in 1914 and Le Heux in 1918 showed that the activity of the intestine is increased by its contained choline derivatives.[6] Choline is

5. Le Heux, J. W.: Arch. f. d. ges. Physiol. **173**:8, 1918. Cassidy, W. J., and Salkin, D.: Am. J. Surg. **12**:299, 1931.

6. Loewi, O.: Arch. f. d. ges. Physiol. **189**:239, 1921. Weiland, W.: ibid. **147**:171, 1912.

changed to acetylcholine and acts as a peristaltic hormone, which greatly increases intestinal activity. In 1921 Loewi demonstrated the relation between acetylcholine and its parasympathetic stimulative action.[7] Dale later proved that acetylcholine is released at all parasympathetic nerve endings on stimulation, subsequently serving as a potent chemical mediator in transmitting the excitatory effect from the nerve endings to the effector cells.[8] The gradual understanding of the chemical mediation of nerve impulses in relation to physiologic function offers a therapeutic working hypothesis in many conditions.

It has been demonstrated that the administration of acetylcholine increases the parasympathetic nerve impulses and stimulates peristalsis of the colon.

Myerson has shown clinically the stimulating action of acetylbetamethylcholine on the bowel by injecting the drug subcutaneously into a group of patients with dementia praecox who were suffering from constipation. Thirty milligrams produced an increase in tone, motility and emptying power of the bowel with one to four evacuations in twenty-four hours in every instance. A series of roentgen films demonstrated such increased motility.[9]

Abbott has used the drug for normal persons and produced an increase in tone and movement of the gastrointestinal tract. Clinically, the drug was effective by mouth in states of constipation and in postoperative distention.[10]

There seems to be no record of a continuous, systematic or successful utilization of any of the cholinergic drugs in the management of megacolon.

As a remedial agent acetylcholine is limited because it is rapidly hydrolyzed to less active substances by certain esterases in the blood stream. In consequence, oral administration is not effective and the result from subcutaneous injection is inconstant unless the dosage is such that the peristaltic action is overshadowed by undesirable toxic manifestations. Although physiologically potent, its instability and its frequently alarming toxic effects on injection discouraged its use in clinical medicine. This explains the general defection from a potentially useful drug.

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7. Loewi, O.: Arch. f. d. ges. Physiol. **193**:201, 1921.

8. Dale, H. H.: J. Mt. Sinai Hosp. **4**:416, 1938; Brit. M. J. **1**:835, 1934. Dale, H. H.; Feldberg, W., and Vogt, M.: J. Physiol. **86**:353, 1936. Cannon, W. B.: Am. J. M. Sc. **188**:145, 1934. Comroe, J. H., Jr., and Starr, I., Jr.: J. Pharmacol. & Exper. Therap. **49**:283, 1933. Clark, A. J.: Applied Pharmacology, ed. 4, Philadelphia, P. Blakiston's Son & Co., 1932.

9. Myerson, A.; Schube, P. G., and Ritvo, M.: Radiology **28**:552, 1937. Starr, I., Jr.; Elsom, K. A., and Reisinger, J. A.: Am. J. M. Sc. **186**:313, 1933.

10. Abbott, W. D.: Am. J. M. Sc. **186**:323, 1933.

Eight years ago Dr. D. Murray Cowie began the use of acetylcholine in the treatment of an infant suffering from typical megacolon. Through the combination of carefully adjusted doses of acetylcholine and acetylbetamethylcholine administered orally and at times by injection and conservative medical measures designed to promote colonic movement, this boy has made a complete recovery. For over two years he has had daily spontaneous evacuations without any medication. This case has served as a stimulus for belief in the therapeutic possibilities of acetylcholine or derivatives in the treatment of disorders characterized by diminished parasympathetic or increased sympathetic tone leading to impaired peristalsis.

In retrospect, one can appreciate how meticulous attention to detail of dosage and combination of simple measures is necessary to establish regular function of the bowel. Even normal persons depend on habit, diet and reasonable care to insure daily evacuations. Yet in subsequent years as patients were treated for megacolon, one was prone to expect acetylcholine or acetylbetamethylcholine to correct the pathologic functional mechanism in a day or two, without recourse to the factor of habit in relation to time or simple auxiliary aids like liquid petrolatum or occasional enemas. In consequence, a number of patients were allowed only a brief therapeutic trial with these drugs before sympathectomy. In several instances successful treatment with drugs was discontinued in favor of operation, partly because of the recognized benefit of sympathectomy and partly due to the occurrence of toxic manifestations from the drug as well as the difficulty of long term management at a distance.

In the early part of 1935 acetylbetamethylcholine (hydrochloride or bromide) [11] became available, and the problem of medical management of megacolon began to change. Acetylbetamethylcholine (synthesized by Major and Cline [12]) is a derivative of acetylcholine. It has the advantageous pharmacologic properties of acetylcholine but is much more stable in the body, producing a definite and continued stimulation of the parasympathetic nerves, usually without untoward toxic manifestations. It slows the heart action, lowers blood pressure, dilates peripheral blood vessels, stimulates sweat glands, increases intestinal tone and peristalsis; it may constrict the bronchioles and incite an asthmatic attack, or in large doses it may produce abdominal pain and vomiting. (The effects of acetylbetamethylcholine may be immediately abolished by the subcutaneous injection of as little as $\frac{1}{400}$ grain [0.0001625 Gm.] of atropine sulfate). The tablet form of acetylbetamethylcholine bromide is fairly stable and thus suitable for oral administration. With this preparation

11. This drug, originally called mecholin, is now marketed under the name of mecholyl (chloride or bromide).

12. Major, R. T., and Cline, J. K.: J. Am. Chem. Soc. **54**:242, 1932.

a method of administration and general management of the patient has been gradually evolved in the last few years with highly satisfactory results; so much so that although most of the patients between 1930 and 1936 received sympathectomy, since 1936 medical therapy has been sufficient, and several previously sympathectomized patients suffering from recurrent severe constipation were relieved with acetylbetamethylcholine.

METHOD OF MANAGEMENT

When a diagnosis of megacolon is made on a basis of examination, a history of obstinate constipation, usually from birth, and abdominal distention, the patient is hospitalized for further investigation and correction of the abnormal mechanics of the bowel. In many instances the colon is loaded with feces, often with fecal concretions accompanied by considerable gaseous distention. Relief is obtained by using each day or every other day enemas of oil or soapsuds and by giving liquid petrolatum orally each night in quantities of ½ to 1 ounce (14.7 to 29.5 cc.). This unloads the colon and reduces distention. Subsequently, a sigmoidoscopic examination may be indicated, followed by an enema of barium sulfate for fluoroscopic and topical roentgen diagnosis. Excessive and damaging colonic distention and constipation secondary to a barium enema can frequently be avoided by instilling a thin mixture of barium sulfate (one-half strength) in moderate quantity under fluoroscopic control. The colon may have to be evacuated with enemas, liquid petrolatum and acetylbetamethylcholine bromide. The administration of this drug is then begun by mouth as a remedial agent in moderate daily doses, gradually increased to a point of effectiveness, short of disturbing toxicity, assisted with liquid petrolatum daily and enemas when required.

Experience has shown that optimal times for administration are one-half to one hour after breakfast, in midafternoon or at any juncture to parallel and enhance an observed daily intestinal rhythm. If given before breakfast, nausea, abdominal pain, vomiting and other toxic symptoms are common. A margin of five to ten days is allowed and expected in order to right an autonomic imbalance and to set up acquired reflexes which are constantly at work regulating intestinal function. An average initial dose of acetylbetamethylcholine bromide is 0.1 Gm., increased, if necessary, in two to three days to 0.2 Gm. and after several days, if indicated, further increased with the addition of 0.1 to 0.2 Gm. administered in midafternoon. Usually 0.2 Gm. after breakfast is effective without the addition of the dose in the afternoon.

As the drug becomes effective enemas are discontinued, though the use of liquid petrolatum is continued as a mild mechanical aid. At times 0.2 Gm. morning and afternoon is required to initiate movements. This quantity may cause diarrhea, in which case it is accordingly reduced.

When stabilized to a dosage which produces one to two stools daily, the patient is discharged, usually with instructions to take 0.2 Gm. each morning one-half hour after breakfast, 1 to 2 tablespoons of liquid petrolatum each evening and an occasional enema in the event of constipation or distention.

Recently, prostigmine bromide has been used as an augmentor of acetylbetamethylcholine bromide. The active principle of the latter drug, acethylcholine, is fairly rapidly destroyed by esterases present in the blood. Prostigmine prevents this destruction. In moderate dosage prostigmine is safe. It does not disturb blood pressure or heart action.[13] Its use may be beneficial.

A more detailed cross section of experience in evolving an effective practical method of administering derivatives of acetylcholine in the treatment of megacolon is shown in the case summaries. The four groups of patients whose histories are presented comprise: (1) patients in whom satisfactory initial drug therapy was abandoned in favor of sympathectomy; (2) patients treated with subcutaneous injections for brief periods with little benefit; (3) patients experiencing obstinate relapse after sympathectomy, which was relieved by drug therapy, and (4) patients whose condition was successfully managed by medical therapy.

DATA ON GROUP 1

CASE 1.—W. H., a boy aged 8 years, had had marked constipation from birth with recurrent attacks of abdominal distention. Previous treatment had been with laxatives and enemas.

Physical examination showed a fairly well developed and well nourished child. There was slight distention of the abdomen with palpable fecal material in the colon and hard fecal masses on rectal examination.

Roentgen examination showed marked increase in the caliber of the entire colon, with some narrowing in the lower rectal region.

The child was placed on the house diet. Oil retention and cleansing soapsuds enemas removed the fecal masses in the colon. This was followed by examination with a barium enema; after the enema had been evacuated the administration of acetylbetamethylcholine hydrochloride was begun. The drug was administered in doses of 0.05 Gm. by mouth each morning after breakfast for three weeks, with satisfactory daily spontaneous stools as a result. During this time the patient gained 8 pounds (3.6 Kg.). He was then transferred to the department of neurosurgery, and medical management with acetylbetamethylcholine hydrochloride was discontinued in favor of left lumbar sympathectomy.

Spontaneous bowel movements began eleven days after operation. The patient was discharged with instructions to take liquid petrolatum daily. Examination following a barium enema three months after sympathectomy showed definite decrease in colonic size. For the past three years he has done well.

Comment.—The initial medical management with acetylbetamethylcholine hydrochloride was entirely successful and could have been continued.

13. Loewi, O.: Arch. f. d. ges. Physiol. **237**:504, 1936.

CASE 2.—R. H., a boy aged 14 years, had had marked constipation for many years, with some intervals of fecal incontinence or diarrhea.

Physical examination showed a well developed and well nourished child. The abdomen was moderately distended, and there was a doughy feeling on palpation, especially in the lower left quadrant.

Roentgen examination after a barium enema showed marked dilatation of the sigmoid and descending colon.

The child was placed on the house diet. Cleansing enemas were administered for two days; then after a barium enema, 25 mg. of acetylbetamethylcholine hydrochloride was given intramuscularly daily without any disturbing toxic manifestations. The bowels moved well every second day. The patient felt better, and the abdomen was soft and within the limits of normal size. At this juncture, despite the preliminary good results, the administration of the drug was discontinued in favor of the left lumbar sympathectomy. Ten days later the patient began spontaneous evacuations which have continued for four years.

Comment.—It is now felt that operation could have been obviated by administering acetylbetamethylcholine hydrochloride in sufficient doses by mouth, in view of its success on injection. Though operation is beneficial in most cases it may, by interruption of nerves at bilateral sympathectomy, have unknown deleterious effects.

CASE 3.—H. S., a boy aged 6 years, had had obstinate constipation from birth. He had been treated with laxatives and enemas.

Physical examination showed a well developed and well nourished child with moderately enlarged abdomen. Results of a sigmoidoscopic examination were negative.

Roentgen examination showed a moderately dilated colon. A second barium enema one month later showed marked dilatation of the entire colon.

The child was put on house diet. Oil retention and cleansing enemas for three days were followed by study by means of a barium enema. One hundred milligrams of acetylbetamethylcholine hydrochloride was then administered by mouth daily for seven days, one-half hour after breakfast. The drug caused some sweating, nausea and an increase in pulse rate on the first two days given. Liquid petrolatum was also given, and the results were three spontaneous evacuations in six days and a gain in weight of 1 pound (0.5 Kg.). The patient then had normal stools daily for six days, taking only liquid petrolatum. Despite this improvement under conservative measures, sympathectomy was considered advisable and done. After operation there was much troublesame distention, for which 60 to 100 mg. of acetylbetamethylcholine hydrochloride administered orally gave considerable relief. An intramuscular injection of 25 mg. on one occasion during this period caused marked parasympathetic symptoms which necessitated giving 1/400 grain of atropine sulfate subcutaneously. Spontaneous stools began one month after sympathectomy and have continued, with the use of liquid petrolatum, for three years.

Comment.—The combined administrations of acetylbetamethylcholine hydrochloride and liquid petrolatum produced satisfactory evacuations. Such response would indicate the desirability of continuing medical management. Overemphasis on the initial toxic parasympathetic symptoms and the expected cure by sympathectomy led to surgical intervention.

DATA ON GROUP 2

CASE 1.—M. S., a girl aged 20 months, had suffered from obstinate constipation from birth, never having had a normal stool. Previous treatment had consisted of rectal dilatation and frequent enemas.

Physical examination showed a fairly well developed and well nourished infant with protuberant, distended, tympanitic abdomen. The outline of the colon was visible, and the colon was palpable.

Roentgen examination showed marked dilatation of the descending colon. The child was put on the house diet. Cleansing enemas were followed by a barium enema. Subcutaneous injection of acetylbetamethylcholine hydrochloride was begun with 10 mg. and increased to 50 mg. Each injection was accompanied by mild to moderate symptoms of toxicity, depending on the size of the dose. There were salivation, flushing, abdominal pain and visible contraction of the colon but no evacuation. Daily administration of 0.1 Gm. of the drug by mouth for three days was without side reactions but also without evacuation. Spinal anesthesia was performed to ascertain the feasibility of sympathectomy. Forty-five minutes after the introduction of 25 mg. of procaine hydrochloride there was a good stool. Left lumbar sympathectomy was done. The postoperative course was disturbed by intractable distention and constipation which necessitated daily enemas. On the twenty-fourth postoperative day 25 mg. of acetylbetamethylcholine hydrochloride given subcutaneously was productive of emesis and a stool. The first spontaneous stool came six weeks after operation. One week after this, 25 mg. of the drug was administered subcutaneously, resulting in a marked reaction with bronchial spasm. Constipation continued, distention increased and the general physical condition became worse, so colostomy was performed. The patient was discharged three weeks later in a satisfactory state with the colostomy working well. Several months later she was in the contagious unit with scarlet fever, and the bowel functions were being carried out satisfactorily.

Comment.—It is the general impression that the very young do poorly with interruption of the sympathetic nerves. This case is an example, particularly in that the response to the spinal anesthetic augured good results. The subcutaneous administration of derivatives of acetylcholine has generally been unsuccessful because of the strong side reactions in doses sufficient to produce evacuation. If given by mouth, the earlier forms of the drug were too quickly hydrolyzed to act over a period sufficient for peristaltic results. Under the present regimen and by using the more stable acetylcholine derivative, acetylbetamethylcholine bromide, there would no doubt have been a just response to therapy.

CASE 2.—T. V. K., a boy aged 2 years, had had obstinate constipation and a large abdomen from birth. Much flatus and occasional vomiting had occurred during the past year. Previous treatment had consisted of laxatives and enemas.

Physical examination showed a well developed and well nourished child, whose abdomen was markedly distended and barrel shaped, with visible peristalsis. The anal sphincter was tight.

Roentgen examination showed marked dilatation of the colon, mainly of the descending and sigmoid parts.

The child was treated surgically with left lumbar sympathectomy. Postoperatively, liquid petrolatum and enemas were required up to three weeks,

when there was an occasional spontaneous stool. The child was discharged with instructions to take 1 teaspoon of liquid petrolatum each night and enemas when required. He was rehospitalized in one and one-half months because of constipation and distention. The gaseous distention was relieved by spinal anesthesia with 90 mg. of procaine hydrochloride. Next morning a subcutaneous injection of 50 mg. of acetylbetamethylcholine hydrochloride brought away flatus and a small stool. There were slight signs of side reactions. The administration of the drug was discontinued and right lumbar sympathectomy done. In three days the bowels began to move spontaneously (with the oral administration of liquid petrolatum) and continued to do so for one month. For the next four and one-half years he took enemas almost daily to relieve constipation and distention. The normal propulsional mechanism then reasserted itself, and for over a year he has had stools nearly daily, aided only with liquid petrolatum.

Comment.—This case is an example of megacolon in which the increased sympathetic stimuli to the colon should have been blocked by bilateral sympathectomy, with consequent relief of constipation if there was good muscular force of the bowel. There was little relief for nearly five years, demonstrating on one hand that sympathectomy does not miraculously restore function of the bowel and on the other that adequate parasympathetic tone and strong colonic musculature are necessary for peristalsis and evacuation. With part of the sympathetic brake removed by left lumbar sympathectomy acetylbetamethylcholine, by stimulating the parasympathetic nerves, would theoretically be the choice in further management.

CASE 3.—G. B., a girl aged 2 years, had suffered with constipation from birth. She had had an enlarged abdomen and been underweight for one year.

Physical examination showed a fairly well developed but poorly nourished child with enlarged protuberant abdomen with a thin wall and easily palpated colon, which had a doughy consistency on palpation.

Roentgen examination after a barium enema showed great distention of the entire colon.

The child was put on the house diet with no medication for eight days as a control test; constipation resulted. Cleansing enemas were followed by a barium enema and roentgen diagnosis. Subsequently the administration of acetylbetamethylcholine hydrochloride was begun, a subcutaneous dose of 10 mg. being used first, with flushing and slowing of the pulse rate by 50 beats per minute. One hour later an injection of 5 mg. was given, with slowing of the pulse rate by 40 beats per minute, some cyanosis and marked visible peristalsis but no bowel movement. Acetylbetamethylcholine hydrochloride was given by mouth in fresh solution daily for the next twenty-four days, beginning with 10 mg. and increasing to 400 mg. three times a day without consistent or satisfactory results. Bilateral lumbar sympathectomy was therefore performed. Spontaneous evacuation began six weeks later and continued daily for eight months. The child was well during this time except for the occurrence of three or four spells of marked bloating. Death took place nine months after sympathectomy from acute intestinal obstruction during an episode of great distention.

Comment.—This case brings out three points: (1) the difficulty and danger of marked toxic parasympathetic symptoms with the subcutane-

ous administration of the early forms of the cholinergic drugs, (2) the ineffectiveness of oral administration of the earlier cholinergic drugs caused by rapid hydrolysis in the gastrointestinal tract, and (3) a common cause of death in these patients from acute intestinal obstruction secondary to extreme distention and kinking of the bowel.

CASE 4.—R. F., a boy aged 5 years had had obstinate constipation from birth. Previous treatment had consisted of daily enemas.

Physical examination showed a fairly well developed and well nourished child. The abdomen was extremely distended, the skin was taut and loops of bowels were visible in active peristaltic waves. No palpable waves were observed.

Roentgen examination showed marked dilatation of the entire colon.

The child was put on a low fiber, light diet. The great distention was attacked by rectal tube and injections of acetylbetamethylcholine chloride, 20 to 50 mg., on four occasions in three days, with little result. After partial relief of the distention with repeated enemas, left lumbar sympathectomy was done. Ten days later there was a spontaneous stool. The child was discharged home in the care of his father, a physician, and readmitted in eight days for generalized abdominal distress, frequent vomiting and marked distention. Cecostomy relieved the distention, but death occurred in three days.

Comment.—Surgical intervention was too late in this advanced case. Death was due to intestinal obstruction secondary to extreme distention and kinking of the bowel.

DATA ON GROUP 3

CASE 1.—R. L., a girl aged 13 years at the time of her last admission to the hospital, had had obstinate constipation and intermittent abdominal distention from 2 months of age.

Physical examination on first admission at the age of 8 years showed a poorly nourished child. The distended, protruding abdomen had prominent superficial veins. There were large palpable fecal masses.

Roentgen examination after a barium enema showed tremendous dilatation of the sigmoid. The remainder of the colon was moderately dilated.

The child was placed on the house diet. Cleansing enemas were followed by a barium enema and roentgen study. She was then treated surgically by left lumbar sympathectomy. Ten days later normal spontaneous stools began. She did well for one year, when she returned, complaining of constipation for four months, which had been eased with enemas. In the hospital on the second admission the bowel was unloaded with enemas and liquid petrolatum. There followed right lumbar sympathectomy, and beginning one week later spontaneous evacuations occurred every second day. The child remained well, with the use of liquid petrolatum, for two months, when she again had difficulty with the bowels and associated distention and vomiting, necessitating hospitalization for the third time. At this visit therapy consisted of heat to the abdomen for relief of distention and the use of a rectal tube and soapsuds enemas.

The child returned in one month for a fourth hospitalization with fecal impactions, which were evacuated with enemas. At this juncture acetylbetamethylcholine hydrochloride was tried by giving 25 mg. intramuscularly. Reaction was almost immediate, with marked sweating and some vomiting, subsiding in fifteen minutes. Because of the reaction it was thought to be impracticable to attempt stabilization with the drug. The patient was accordingly discharged with instructions to

take liquid petrolatum and enemas as needed. For forty-two months there were daily evacuations, but in the last few months of this period there was much bloating, which brough her into the hospital for the fifth time. On this admission the abdomen was greatly distended and taut, visible peristalsis was marked and there were many palpable fecal masses. She was given liquid petrolatum and cleansing enemas. Roentgen examination after a barium enema showed the size of the colon to be increased over that seen in a comparable study five years previously. The members of the department of neurosurgery felt that they had nothing to offer. Acetylbetamethylcholine bromide was instituted by oral administration of 50 mg. daily, one-half hour after breakfast; the dose was increased to 100 mg. in two days, and the bowels moved regularly on this dose, without any toxic manifestations from the drug, for three months. The patient returned for a check-up examination at this time. On her sixth admission she was asymptomatic, had a good appetite and was gaining weight although examination showed considerable abdominal distention. The acetylbetamethylcholine bromide was increased to

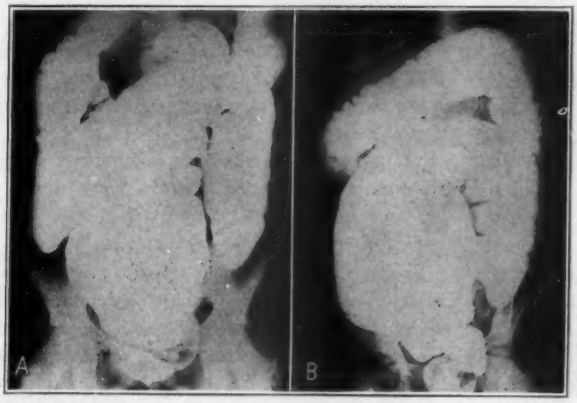

Fig. 1 (case 1, group 3).—The first roentgenogram, *A*, was taken after an enema of barium sulfate just prior to sympathectomy. The second, *B*, taken four years later after an obstinate relapse following a second sympathectomy, demonstrates little or no change in the colonic size. The patient was relieved by oral administration of acetylbetamethylcholine bromide.

0.2 Gm. daily, one-half to one hour after breakfast. She has continued to take this drug for the past six months and has been doing well.

Comment.—Left and then right lumbar sympathectomy, each followed by disturbing relapses, indicate that operation does not entirely solve the therapeutic problem of megacolon. The use of acetylbetamethylcholine bromide, by stimulating the parasympathetic nerves, gave relief. The effectiveness of this drug was probably increased by the previous sympathectomy which had blocked out excessive sympathetic stimuli to the colon.

Case 2.—L. F., a boy aged 15 years at the time of his last admission to the hospital, had had obstinate constipation from birth, with abdominal distention for several years. Previous treatment had consisted of the use of liquid petrolatum, laxatives and enemas, with moderate results.

Physical examination on first admission, when the patient was 8 years of age, showed a fairly well developed and well nourished child. The abdomen was distended and tympanitic, with visible peristaltic waves and a continually changing contour. There was a fecal tumor mass the size of a small coconut in the midepigastrium.

Roentgen examination after a barium enema showed a hugely dilated sigmoid flexure, with moderate dilatation of the remainder of the colon.

Liquid petrolatum and soapsuds and oil retention enemas evacuated the bowel of fecal masses. Troublesome distention was relieved by spinal anesthesia. This was followed by a barium enema and roentgen examination; after evacuation left lumbar sympathectomy was done. Marked postoperative distention responded to hot fomentations and the use of a rectal tube. Liquid petrolatum and enemas were used for ten days, when spontaneous stools began. He was discharged with instructions to take liquid petrolatum daily and enemas as required.

The bowels moved satisfactorily for six and one-half years, when the patient went for two months without a stool. Medical attention was then necessary to relieve an impaction. After that he had a stool every two to four days with the aid of enemas.

Physical examination on second admission, when the patient was aged 15, showed a well developed and well nourished boy. The abdomen was moderately protuberant, slightly distended but soft. There were hard palpable fecal masses in the left lower quadrant.

Roentgen examination after a barium enema showed marked dilatation of the entire colon. Liquid petrolatum and cleansing enemas were given to evacuate fecal masses. Two tenths of a grain of acetylbetamethylcholine bromide was given immediately after the key film for the barium enemas was taken. Films were taken one, three, eight and twenty-four hours after the drug was given, and these demonstrated normal peristalsis and contraction of the ascending and transverse colon. There were four evacuations in twenty-four hours. The film taken twenty-four hours after the barium enema did not show the ascending tranverse and descending colon to be abnormally large.

An unsuccessful attempt was made to control the patient's condition with liquid petrolatum and enemas. Treatment with acetylbetamethylcholine bromide was then begun, 0.1 Gm. daily before breakfast, which immediately gave rise to large daily unaided stools. The administration of liquid petrolatum was continued. Toxic symptoms from the drug consisted of occasional soreness of the stomach, some dizziness and nausea and vomiting twice. These symptoms were controlled by changing the time of administration to one-half hour after breakfast. Regular bowel movements have continued, with the aid of acetylbetamethylcholine bromide for the last four months.

The effect of 0.2 Gm. of this drug on blood pressure and pulse in this patient was as follows:

	Blood Pressure	Pulse
Before medication	110/40	76
15 minutes after	110/40	70
30 minutes after	112/40	72
45 minutes after	106/40	76
60 minutes after	110/40	74

Comment.—This is an example of a "cure" by sympathectomy for six and a half years followed by an obstinate relapse, which was corrected by the oral administration of acetylbetamethylcholine bromide.

This case again illustrates the effectiveness of stimulation of the parasympathetic nerves in producing regular evacuations. Toxic symptoms from the drug were negligible, and there was essentially no change in the blood pressure or pulse rate following its administration.

DATA ON GROUP 4

CASE 1.—K. B., a boy aged 7 years, had had constipation from birth and moderate abdominal distention. He had been treated with daily enemas, liquid petrolatum and frequent rectal dilations.

Physical examination showed a well developed and well nourished child. There was moderate abdominal distention and tympany.

Roentgen examination after a barium enema showed marked dilatation of the entire colon. A second barium enema, with a thin mixture, was followed immediately by the administration of 0.2 Gm. of acetylbetamethylcholine bromide. Films taken one, three, eight and twenty-four hours later showed definite decrease in the size of the lumen and tone of the colon. There was evidence of contraction of the colon following administration of the drug.

The patient was placed on the house diet. Cleansing enemas were followed by a barium enema and a test with acetylbetamethylcholine bromide, demonstrated in roentgenograms. He was given enemas as circumstances required and 30 cc. of liquid petrolatum each night. Acetylbetamethylcholine bromide, 0.1 Gm. before breakfast for one day, gave no results. Fifteen milligrams of prostigmine bromide was added, with no results in three days. Then 0.2 Gm. of acetylbetamethylcholine bromide and 15 mg. of prostigmine were given before breakfast, without evacuations. The dose of the acetylbetamethylcholine bromide was increased to 0.2 Gm. twice daily, one before breakfast and once in the midafternoon, and 30 mg. of prostigmine was given before breakfast. This medication produced large stools daily. Some nausea and vomiting soon after morning medication were controlled on shifting the morning dose to one-half hour after instead of one-half hour before breakfast. The drug was well tolerated. He continued to have bowel movements regularly, and he was discharged with instructions to take 0.2 Gm. of acetylbetamethylcholine bromide twice daily, 30 mg. of prostigmine bromide daily and 30 cc. of liquid petrolatum each night. He did well at home; the afternoon dose was omitted, and he has continued to have one to two stools each day for the past six months without enemas. At home, mild toxic manifestations consisted of slight nausea, perspiration about the face and some drowsiness beginning one and one-half hours after taking acetylbetamethylcholine bromide and lasting about fifteen minutes.

The recorded effect of oral administration of 0.2 Gm. of this drug on the blood pressure and pulse rate was as follows:

	Blood Pressure	Pulse
Before medication	90/50	100
15 minutes after	94/54	96
30 minutes after	94/50	92
45 minutes after	92/54	98
60 minutes after	92/54	96

Comment.—This patient was brought to the clinic for sympathectomy. Daily oral administration of acetylbetamethylcholine bromide has produced regular bowel movements for over six months.

CASE 2.—J. P. S., a girl aged 9 years, was first admitted to the hospital at the age of 6 years. She had had constipation for two years.

Physical examination showed a well developed and well nourished child. There was a prominent abdomen with little distention. No masses were observed.

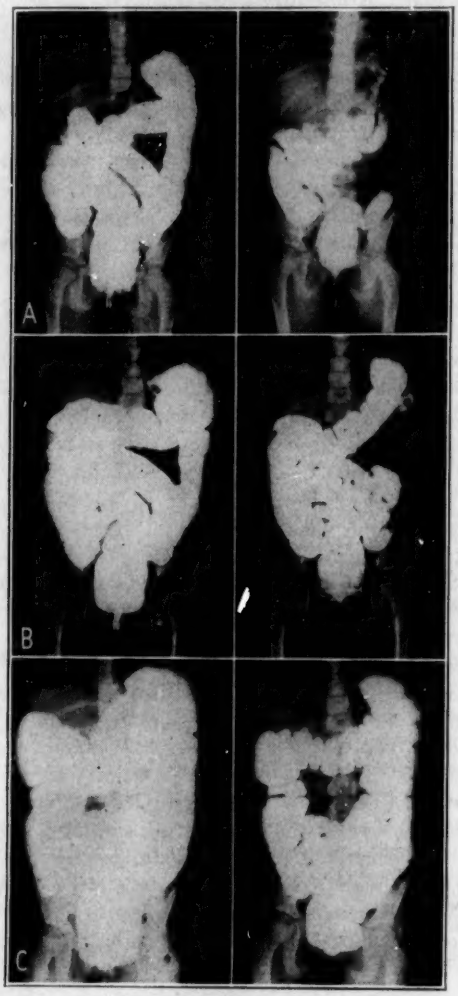

Fig. 2 (case 2, group 4).—Roentgenograms taken after a barium enema, showing progressive enlargement and dilatation of the colon. After the first two pictures, *A*, were taken, a diagnosis of simple constipation was made and conservative therapy with liquid petrolatum was followed until the end of the second and third barium enemas (*B*, fifteen months and *C* forty-five months after *A*), when obvious signs and symptoms indicated the diagnosis. Acetylbetamethylcholine bromide gave complete sympathetic relief. Earlier treatment would have been advisable.

Roentgen examination after a barium enema showed increased colonic caliber without typical findings of megacolon.

The symptoms were controlled with the use of liquid petrolatum and an abdominal belt.

A second admission, at the age of 7 years, was occasioned by episodes of abdominal distention, pain and vomiting followed by evacuation of a large stool, about once a month.

Physical examination showed a moderately enlarged and distended abdomen.

Roentgen examination showed a moderate degree of megacolon.

The administration of 30 cc. of liquid petrolatum each evening, cleansing soapsuds enemas and 0.15 Gm. of acetylbetamethylcholine bromide daily after breakfast gave no results for eight days, at which time the dose was increased to 0.3 Gm. Two days later a bowel movement occurred. The stool was passed several hours after the administration of the drug. There were no toxic manifestations. The bowels moved daily for ten days with one exception. The patient was sent home with instructions to use liquid petrolatum and acetylbetamethylcholine bromide and continued to have daily stools for two months, when the medicine ran out. She continued to use liquid petrolatum and enemas, doing fairly well for five months.

On her third admission, ten months after the previous discharge, there was complaint of constipation, fecal incontinence, abdominal pain, distention and vomiting at intervals for three months previously.

Physical examination showed her to be underweight; marked abdominal distention, some visible peristalsis and many palpable fecal masses were noted.

With enemas and liquid petrolatum she had daily stools. She was discharged in sixteen days with instructions to take liquid petrolatum. By mistake acetylbetamethylcholine bromide was not prescribed.

At the patient's fourth admission, at the age of 9 years, she complained of marked alternating constipation and fecal incontinence for over one year.

Physical examination showed malnutrition and protuberant, distended abdomen, with visible peristalsis and colonic patterns. A large palpable fecal mass was felt in the lower part of the left side of the abdomen.

Roentgen examination after a barium enema showed marked dilatation of the entire colon.

The patient was put on the house diet. The fecal impaction was removed with oil retention and soapsuds enemas. Liquid petrolatum, 30 cc. each evening, and enemas as conditions warranted were ordered. The administration of acetylbetamethylcholine bromide, begun with a dose of 0.1 Gm. two hours after breakfast, for two days gave no results; an increase to 0.2 Gm. excited vomiting fifteen minutes after taking the drug but no stool. After four days a change was made to 0.1 Gm. at 10 a. m., 2 p. m. and 6 p. m. and continued for four days. There were no results. Then a trial of 0.3 Gm. given at 10 a. m initiated daily stools, which continued without enemas. She was sent home with instructions to continue this program, which has produced daily stools with no toxic reactions for eleven months.

Comment.—There was a progression of the disease under conservative treatment. Further progression was caused by interrupted drug therapy (acetylbetamethylcholine bromide). There were satisfactory and continued results with detailed management combining liquid petrolatum and this drug.

CASE 3.—E. L. R., a boy aged 12 years, had had alternate, intermittent and increasing difficulty from constipation or incontinence of feces for eight years.

Physical examination showed a soft, slightly prominent abdomen with a palpable fecal mass in the right lower quadrant. Sigmoidoscopic examination showed a large colon and rectum.

Roentgen examination after a barium enema showed the entire colon to be moderately dilated. There was a reduction in the size of the colon twelve hours after the ingestion of 0.3 Gm. of acetylbetamethylcholine bromide.

The boy was placed on the house diet. Cleansing enemas for four days were followed by a barium enema, then by ingestion of 3 Gm. of acetylbetamethylcholine bromide, which caused some nausea and flushing for ten minutes. The barium

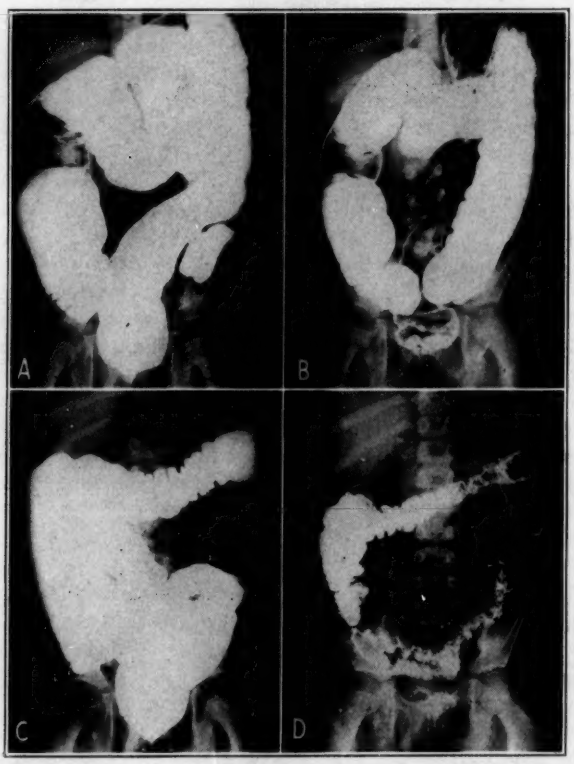

Fig. 3 (case 3, group 4).—*A* shows the colonic pattern before and *B* (taken twelve hours later) the pattern after evacuation of the first barium enema. *B* shows slight reduction in colonic size. *C* and *D* (taken twelve hours later) show the colonic patterns preceding and following the second barium enema one week after the first. The marked reduction in colonic size, shown in *D*, followed the ingestion of 0.3 Gm. of acetylbetamethylcholine bromide.

was evacuated with enemas, then administration of the drug was begun with 0.2 Gm. one hour after breakfast. There were three stools in five days, one assisted by an enema. The medication was increased to 0.2 Gm. morning and afternoon, and in two days the bowels moved twice daily regularly for seven days,

when the afternoon dose was omitted. The patient was discharged with instructions to take 0.2 Gm. daily and, if necessary, 1 tablespoon of liquid petrolatum each evening.

On the patient's second admission two and one-half months later, a history of complete evacuation every second day was given. He had had 0.2 Gm. of acetylbetamethylcholine bromide daily one hour after breakfast but no liquid petrolatum.

Physical examination showed no essential change. The patient was hospitalized for fourteen days for trial without medication. He responded with spontaneous daily stools and has remained well for four months.

Comment.—The successful initiation of regular bowel habits with drug therapy continued for three months, after which the bowels moved unaided.

CASE 4.—Y. R. S., a girl aged 7 years, had had obstinate constipation from birth, with exacerbation and considerable distention in the last few preceding months. Past treatment had consisted of the use of liquid petrolatum and frequent enemas.

Physical examination showed an underdeveloped and underweight child, who appeared chronically ill. The abdomen was markedly distended and tympanitic. The colon was distinctly palpable and filled with firm fecal masses.

Roentgen examination showed the entire colon, with the exception of the distal sigmoid flexure and rectum, greatly dilated. Two-tenths grams of acetylbetamethylcholine bromide was given orally immediately after a barium enema, and films were taken one, three, eight and twenty-four hours afterward. These plates showed evidence of contraction in the descending colon and sigmoid flexure; there was much less residual barium in the colon twenty-four hours after ingestion than in a previous barium series.

The patient was placed on the house diet. Cleansing enemas and the administration of liquid petrolatum daily for three days were followed by a barium enema. Administration of acetylbetamethylcholine bromide was begun with 0.2 Gm. one-half hour after breakfast; in three days the bowel movements began and continued daily for sixteen days. Distention decreased; the patient gained weight and felt better. She was sent home with instructions to take 0.2 Gm. of the drug daily and 1 tablespoon of liquid petrolatum each evening. Progress was maintained satisfactorily for two months, until her supply of tablets ran out, when it was necessary to use enemas.

The second admission was three months after the first. There had been constipation and some distention for one month. The patient was given cleansing enemas and then 0.2 Gm. of acetylbetamethylcholine bromide daily one-half hour after breakfast. Daily stools began next day. She was sent home with instructions to take 0.2 Gm. of the drug daily; she did well for six months with this therapy. Again she ran out of tablets but continued to evacuate normally with the aid of 1 tablespoon of liquid petrolatum each night.

The third admission was nine months after the second. The patient came in for a check-up examination. Physical examination showed she had gained eight pounds in one year but still appeared malnourished and was not a vigorous child. The abdomen was distended and soft; no fecal masses were observed.

Roentgen examination after a barium enema showed the size of the colon to be comparable to that of one year ago. She was discharged with instructions

to take liquid petrolatum and has remained well for four months. The effect of 0.2 Gm. of acetylbetamethylcholine bromide given orally on blood pressure and pulse follows:

	Blood Pressure	Pulse
Before medication	98/70	96
15 minutes after	94/62	88
30 minutes after	88/60	92
45 minutes after	84/54	90
60 minutes after	86/56	90

Comment.—The patient in this case responded quickly to acetylbetamethylcholine bromide, relapsed two months later without it, was then well for six months with medication and for the past four months has evacuated spontaneously without any medication except liquid petrolatum each evening.

Fig. 4 (case 5, group 4).—*A*, taken after a barium enema, shows marked dilatation of the colon, the patient's symptoms being diarrhea, abdominal pain and pronounced distention. *B*, taken after a second barium enema after eight days' subcutaneous administration of acetylbetamethylcholine hydrochloride, demonstrates marked improvement in colonic size and retention of tone.

CASE 5.—F. Du B., a man aged 34, complained of pain in the abdomen, distention and diarrhea for two years, with loss in weight.

Physical examination showed a well developed, undernourished man, who had marked abdominal distention. He was treated for duodenal ulcer. Six weeks later the abdomen was still markedly distended. A barium enema showed a greatly dilated colon, though the haustral markings were moderately well preserved. Sigmoidoscopic examination showed the colon to be enormously dilated, with preservation of sphincter tone. These observations led to a tentative diagnosis of megacolon and a trial of acetylbetamethylcholine hydrochloride to see if by its use the size of the colon could be reduced. For eight days the patient was given 50 mg. of the drug subcutaneously in the morning and two 25 mg. doses in the afternoon. There were moderate toxic effects, such as flushing, sweating and a fall in systolic blood pressure of 30 points. There was no pain or nausea and no desire to defecate. Flatus was passed, the size of the abdomen was

reduced and the patient felt more comfortable. On termination of the administration of the drug a check-up barium enema demonstrated marked improvement in colonic size and restoration of tone. The patient was discharged on a Sippy regimen; he was to have taken the drug also but arrangements could not be made for this to be done.

Comment.—This case is included to demonstrate the decrease in size of the colon under drug therapy.

CASE 6.—J. N., a girl aged 3 years, had had obstinate constipation from birth, intermittent abdominal distention and vomiting for one year. Previous treatment had been with liquid petrolatum and daily enemas.

Physical examination showed a well developed, moderately well nourished child. There was marked abdominal distention, with visible peristaltic waves and colonic patterns. Proctoscopic examination showed no abnormality.

Roentgen examination after a barium enema showed marked dilatation of all parts of the colon. Ingestion of 0.2 Gm. of acetylbetamethylcholine bromide immediately after the enema produced no roentgen evidence of increased peristalsis.

A regimen of low residue diet and enemas for four days was followed by examination with a barium enema. Enemas were necessary to evacuate the barium. Treatment with acetylbetamethylcholine bromide, begun with 0.1 Gm. one-half hour after breakfast, in two days produced one or two formed stools per day. Gaseous distention was relieved with a rectal tube and an occasional enema. The condition remained satisfactory for three weeks, though there was a tendency to looseness of the bowels. Scattered vesicles appeared on the trunk similar in appearance to those of chickenpox. During the next week these vesicles increased in number over the body and assumed a form diagnostic of bromoderma. In this period much gaseous distention required Wagensteen suction for relief. Acetylbetamethylcholine bromide was changed to acetylbetamethylcholine hydrochloride, and the eruption cleared partially. Diarrhea developed at this juncture, four and one-half weeks after beginning treatment, and the administration of the drug was discontinued. There were symptoms of bromide poisoning, the diarrhea could not be checked and the patient died in two weeks.

The bromide poisoning was due to drug idiosyncrasy.

SUMMARY

Experimental evidence, neurosurgical interruption of the sympathetic nerves to the colon and cholinergic drug action support the neurogenic theory of megacolon as a functional imbalance of the autonomic nervous system supplying the colon. Detailed theories of the exact pathologic mechanism because of incomplete, imperfect and conflicting anatomic evidence are not yet justified. One of two basic etiologic working hypotheses is probable: (*a*) hyperactivity of the sympathetic nerves to the colon and (*b*) diminished tonus of the parasympathetic innervation of the colon with associated insufficient relaxation of the internal sphincter.

Decision for sympathectomy, the remedial agent for hyperactivity of the sympathetic nerves, is usually empiric, as there is no exact test for

sympathetic hyperactivity. Sympathectomy is generally not indicated in the very young, and results are minimal in those patients with great colonic dilatation and weak musculature. Patients with colonic hypertrophy and vigorous visible peristalsis respond best to operation.

Administration of a cholinergic drug, the remedial agent for diminished tonus of the parasympathetic nerves, is empiric and the only known functional test of tonus.

The pharmacologic action of acetylcholine and its derivatives is reviewed. Their toxic actions and the instability of some of the early products explain the general defection from a drug physiologically potent in treatment of megacolon.

Acetylbetamethylcholine (hydrochloride or bromide) has not been therapeutically successful in the past because the time element in rectifying autonomic imbalance has not been duly considered.

A successful method of management with acetylbetamethylcholine is presented in detail, with 15 illustrative cases.

ORAL CONDITIONS OF CHILDREN IN RELATION TO STATE OF GENERAL HEALTH AND HABITS OF LIFE

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The infirmary where this study has been carried out is visited daily by 200 to 300 children, ranging in age from 2 to 14 years. The great majority of this number are in need of immediate dental care. Only a few are even relatively free from dental caries, and a detailed examination of children over 4 years of age almost invariably discloses the existence of some carious lesions. Frequently such extensive and rapid disintegration of the teeth occurs that neither the regular operative treatment nor oral prophylaxis prevents the continuous progress of the disease. During the last year two groups of children, representing extremes in dental condition, have been studied with respect to their previous history and their present state of health and nutrition.

SELECTION OF SUBJECTS

After a survey of the frequency and character of dental caries in 200 patients, 32 children were selected for intensive study. The selection was based entirely on the incidence and type of dental caries present. Fourteen of the children, designated as group 1, had a remarkably low incidence of dental caries. Eighteen children, designated as group 2, had extensive dental decay. All the children were American born. The age range in each group was from 4 to 13 years, with the average age approximately 9 years.

In view of the fact that the detection of the first clinical signs of dental caries [1] as well as of developmental lesions of the enamel requires minute observation, approximately one and a half hours were devoted to the oral examination of each child. The final record was made after the cleaned and dried surfaces of the teeth had been examined and the

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1. The term dental caries here also refers to the very first stages of caries, which manifest themselves as slight changes in the translucency of the enamel ("precaries"), as found by a minute study of the cleaned and dried smooth surfaces of the teeth.

diagnosis had been aided by roentgenograms. During the period of selection it was observed that this method of cleaning and drying the teeth before studying them in detail usually revealed one or more superficial lesions even in mouths which by the common procedure for dental examinations (use of mirror and explorer) seemed to be free from caries. The importance of such a detailed examination is evident from table 1.

ORAL FINDINGS

An attempt has been made to study the oral manifestations as they are related to (1) the previous and (2) the present history of the children.

Relation to Previous History.—The origin of certain oral disorders, such as hypoplastic lesions of the teeth, obviously lies far back in the history of the children. In studying the developmental defects in

TABLE 1.—*Incidence of Caries as Found by Two Types of Examination*

Group	No. of Children Examined	No. of Teeth Examined: Deciduous	No. of Teeth Examined: Permanent	Type of Examination	Children with Dental Caries, %	No. of Teeth with Caries: Deciduous, %	No. of Teeth with Caries: Permanent, %	No. of Teeth with Caries: Total, %
1	14 *	150	181	Ordinary*	57	4.7	10.5	7.9
				Minute †	93	11.3	18.2	15.1
2	18	158	268	Ordinary*	100	71.0	55.0	60.5
				Minute †	100	93.0	80.5	86.0

* Ordinary examination with mirror and explorer.
† Minute examination after cleaning and drying of the teeth, aided by roentgenographic diagnosis.

the enamel, only those lesions were recorded which could be seen with the unaided eye. So-called mottled enamel is not included under the term hypoplasia in this study. It should be stated that when the attack of caries is extensive, as in the children of group 2, it is nearly impossible to determine to what extent hypoplasia may have preceded the carious disintegration of the enamel surface. In the children of group 1, however, the preeruptive as well as the posteruptive lesions were all of a superficial character, 10 per cent of the teeth being affected with hypoplastic enamel defects. In order to investigate the relation between dental hypoplasia and caries, it was therefore assumed that one would obtain more reliable information by restricting the data to a comparison of the individual teeth of the children in group 1. The results are given in the following tabulation:

	Percentage of Nonhypoplastic Teeth with Caries	Percentage of Hypoplastic Teeth with Caries
Deciduous	12.0	25.0
Permanent	20.2	21.0
Total	16.5	22.5

It is evident that the hypoplastic teeth showed a greater tendency to decay than the properly formed teeth.

The view that malocclusions and deformities of the jaw frequently are related to the early history is increasingly emphasized in the field of orthodontics. An examination of the two groups with respect to these conditions revealed significant differences, as will be seen from table 2.

It will be observed that in group 2 a third of the children had malformations interfering with the posterior occlusion of the jaws and that more than half of them had a high, narrow palate. In group 1 neither of these disorders could be found. Irregularities of the teeth were limited to slight crowding in the anterior part of the dental arch in 4 of the 14 children. Two of them had very large teeth and high labial position of the permanent cuspids, a condition which, according to the information obtained, may have been inherited.

TABLE 2.—*Relative Position of the Jaws and Teeth and Form of the Palate in Two Groups of Children*

Group	Neutral Occlusion, %	Neutral Occlusion and Crowding, %	Distal Occlusion and Protrusion, %	Mesial Occlusion, %	Form of Palate	
					Normal, %	High, Narrow, %
1	64	36	0	0	100	0
2	44	22	34	6	44	56

It is a well known fact that dental caries, treated or untreated, leaves permanent manifestations in the teeth. Only a rough estimate may be made as to the time of the primary attack. Teeth which are badly broken down by caries or have been mechanically repaired thus may be considered indications of an earlier attack of the disease, the causes of which might lie years back in the history of the patient.

It is generally accepted that no teeth are more frequently attacked by caries than the first permanent molars. Such was found to be the case in this study, in which nearly all the carious defects found in the permanent dentition of the children of group 1 were limited to these teeth. A special study of the first permanent molars thus offered the best opportunity for comparing the two groups as to the severity of dental caries and its localization. In chart 1 the five different surfaces of these teeth are considered separately. The number of attacked surfaces is figured in percentage of total surfaces, and an average is recorded for each group. It will be noticed that most of the carious lesions found in group 1 are of a superficial character, whereas in group 2, 87 per cent of all affected surfaces, filled cavities included, are subject to advanced stages of the disease. The number of treated surfaces in percentage of

all affected surfaces was 32 per cent for group 1 and 30 per cent for group 2. Thus the mechanical repair of the lesions was found virtually the same in both groups. It is also evident from chart 1 that the different surfaces of the teeth were not equally susceptible to caries, the occlusal surfaces being most and the distal least liable to decay.

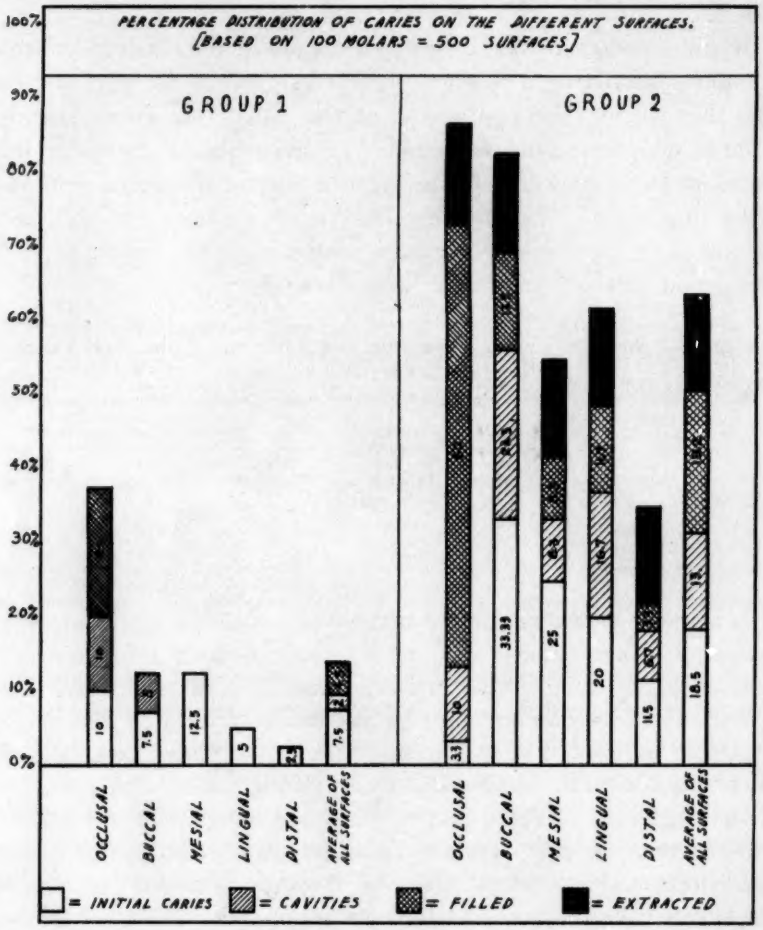

Chart 1.—Condition of the first permanent molars in the two groups of children.

Relation to Present History.—The type of a carious lesion gives certain indication of the activity of the process. Since the first clinically visible signs of caries manifest themselves as slight changes in the enamel surface,[1] special attention was paid to the examination of the enamel. The primary lesions of dental caries may be favorably studied on those surfaces which are without natural fissures, especially the cervical part of the labial-buccal and the lingual-palatinal surface. After cleaning and

extensive drying of the teeth, initial lesions may be detected even at a very early stage, appearing as white opaque lines or spots. These lesions are referred to as "precaries." The incidence of these first criteria of incipient caries is shown in table 3.

In several of the children of group 2 wide areas of the enamel surfaces were extensively attacked by these lesions, as many as sixteen surfaces of the teeth being affected. By studying the children over a period of months, we could notice the progressive nature of these lesions to the point where the enamel became of a soft chalky consistency. The discovery of this marked attack of initial disintegration of the enamel, in addition to the high frequency of advanced destruction of the tooth, would indicate that the factors involved in the primary stage of caries

TABLE 3.—*Incidence of Initial Lesions of the White Enamel ("Precaries") in Two Groups of Children*

Group	Percentage of Children with "Precaries" in		Percentage of Affected Surfaces in All Surfaces That Possibly Could Be Attacked	
	Deciduous Teeth	Permanent Teeth	Deciduous Teeth	Permanent Teeth
1	0	14	0	4.7
2	55	93	12	43.0

TABLE 4.—*Total Percentage of Carious Surfaces*

Group	Deciduous Teeth			Permanent Teeth		
	Surfaces Examined	Carious Surfaces	Percentage Carious	Surfaces Examined	Carious Surfaces	Percentage Carious
1	680	18	2.65	809	44	5.45
2	721	346	47.98	1,197	471	39.34

were present at the time of the study. Such manifestations were not apparent in the children of group 1. Table 4 gives a summary of the total attack of caries.

The oral examination of the children was not confined to the teeth but included observations regarding the condition of the gingivae and oral hygiene.

The general condition of the gingivae was classified as "good" in 85 per cent of the children of group 1 as compared with 39 per cent of the children of group 2. The remaining 15 per cent of group 1 and 61 per cent of group 2 showed evidence of gingival inflammation. In most cases the gingivitis was limited to superficial inflammations localized at the gingival margin. The interdental papillae between crowded teeth were especially affected. The gingival condition in only 1 child, a patient of group 2, was classified as definitely poor.

In order to obtain some information about oral hygiene, the children were questioned as to the use of toothbrushes. The occurrence of stain

and deposits on the teeth was recorded. According to the information obtained, approximately 70 per cent of the children in each group cleaned their teeth regularly. Stain on the teeth was noticed with nearly the same frequency in both groups, being slightly more prevalent in group 1. Accumulations of food debris on the teeth, however, were most marked in group 2. This was to be expected, because of the great number of cavities present, which act as depositories for debris.

MEDICAL AND NUTRITIONAL FINDINGS

The object of the next phase of the investigation was to secure as comprehensive information as possible regarding the physical condition and dietary habits of (1) the mother during pregnancy, (2) the child during early childhood, especially the first year of life, and (3) the child at the time of the study.

This information was obtained largely through a series of personal interviews with the mothers of the children studied. The limitations inherent in data secured by this means are fully appreciated. It must be assumed that a mother's account of the health experiences of her child can be neither completely objective nor entirely accurate in every detail. Yet a degree of reliability which is adequate for comparative purposes is believed to have been attained in this study. The procedure of history taking and recording was identical with that used for all patients registered in the medical and the nutritional department of the infirmary, these technics having been developed and tested by various means over several years. The interviews were fact-finding rather than educational in purpose, no attempt being made to influence the dietary habits of the children during the course of the study. In each case a cordial relation was established which encouraged the mother to talk without restraint. The interest of the mothers is indicated by the fact that several wrote to the infirmary between interviews to confirm or enlarge on information previously given. All data were collected and recorded with meticulous care, then rechecked during the series of contacts with each mother and child. In many instances it was possible to verify the mother's statements by hospital or clinic reports.

Physical Condition and Dietary Habits of Mother During Pregnancy.—Record was made of the mother's age at the birth of the child and the total number of her pregnancies (including miscarriages and stillbirths), with their time relation to the pregnancy under consideration. Tabulation of this data follows:

	Group 1	Group 2
Average age of mother at birth of child.....	28.1 yrs.	32.1 yrs.
Average number of previous pregnancies.....	1.4	2.4
Average number of subsequent pregnancies....	0.9	1.2

It may be considered of possible significance that at the birth of the children studied the mothers of the children of group 1 were on the whole younger and had previously borne fewer children than the mothers of the children of group 2. The average number of total pregnancies was likewise smaller.

As detailed information as possible was recorded for the prenatal period of each child in the study. Because of the anamnestic quality of this information, it seemed inadvisable to correlate any single factor with the dental condition of the subjects. To facilitate general comparison of these histories, desirable health standards for pregnancy were formulated on the basis of a publication of the United States Department

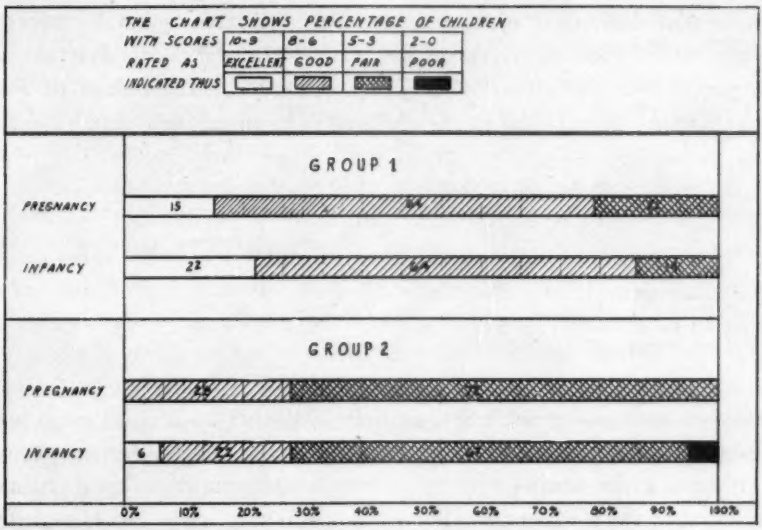

Chart 2.—Ratings for condition during pregnancy and infancy.

of Labor,[2] and a numerical rating was arbitrarily assigned for each of the following factors: age of the mother, extent of medical supervision, history of general health, hygiene, existence and duration of nausea or vomiting and character of the diet. The relation which each final score bears to 10 indicates the degree to which that individual history approaches standards generally recognized as desirable for the prenatal period. A summary of the distribution of the final ratings in groups 1 and 2 is presented in chart 2. It will be observed that 79 per cent of the prenatal histories of the children in group 1, but only 28 per cent in group 2, fell in the excellent or good classification.

Physical Condition and Dietary Habits of the Child During the First Year of Life.—Information was secured from the mother as to whether

2. The Expectant Mother, Folder 1, United States Department of Labor, Children's Bureau, 1936.

the baby was pronounced full term or premature by the physician, and the birth weight with comments regarding the neonatal period was recorded. As accurate and detailed a history as possible was obtained for the baby's first year of life. On the basis of another publication of the United States Department of Labor,[3] a rating scale similar to that devised for the pregnancy was formulated for the first year of life, and a rating was assigned for each of the following factors: extent of medical supervision, readiness of adjustment to food, existence and duration of breast feeding, diet of the mother during lactation, age at which cod liver oil and orange juice were added to the diet, character of the remainder of the diet and history of the general health and progress. The relation which each final score bears to 10 signifies the degree to which that individual history approaches standards generally accepted as desirable for the first year of life. It will be observed (chart 2) that 86 per cent of the children of group 1 were rated excellent or good, whereas only 28 per cent of the children of group 2 were thus rated. It

TABLE 5.—*Comparison of Histories of Breast Feeding in Groups 1 and 2*

	Percentage of Children of Group 1	Percentage of Children of Group 2
Never breast fed	7	39
Breast fed for 1-4 weeks	36	5
Breast fed for at least 3 months	57	39
Breast fed for at least 7 months	43	33

seems of special significance that only 1 mother of a child in group 1 reported feeding difficulties, whereas 9 mothers of children in group 2 mentioned failure to adjust to formulas, regurgitation of food, habitual crying after the feeding period or similar difficulty. Statements regarding the baby's good nature and successful adaptation to routine occurred with notable frequency in the histories of the children of group 1.

Considerable difference between the two groups was found to exist in one aspect of the early nutrition history, namely, breast feeding. When a mother is healthy and well nourished, breast milk is considered unique in its ability to meet the requirements of developing human tissues. Dental education continually stresses the favorable effect of breast suckling on the dental arch and the muscles of throat and jaws. The United States Children's Bureau advises seven or eight months of breast feeding. Public health authorities frequently state that three months is the minimum period desirable and that even a few weeks of breast feeding is preferable to none at all. These recommendations have been used as a basis for table 5, which summarizes the histories of breast feeding of

3. Keeping the Well Baby Well, Folder 9, United States Department of Labor, Children's Bureau, 1938.

the children of groups 1 and 2. It will be noted that the percentage of children who received breast milk for either the seven month period, the three month period or the first few weeks of life is significantly higher in group 1 than in group 2.

Occurrence of Disease Previous to Period of Study.—Careful inquiry was made as to the incidence of infectious diseases and of other illnesses among the children studied. Consideration of the data obtained showed no consistent difference between the groups in relation to the infectious diseases reported, namely, measles, chickenpox, mumps, whooping cough and scarlet fever. Since information obtained throughout the study indicated that medical attention was more frequently sought in group 1 than in group 2, it is conceivable that failure of proper diagnosis may have affected the apparent incidence of disease in group 2. No striking difference was evident in relation to other illnesses with one possible exception; namely, the occurrence of five bone fractures in 3 members of group 2. Evidences of old rickets were later observed in these 3 children. No fractures were reported in group 1.

Present Physical Condition.—It is the routine of the infirmary for each child referred to the nutrition department to receive a medical examination on his first visit and as frequently thereafter as the physician deems advisable. The purpose of these examinations is largely the discovery of physical defects. Children found to have defects are referred to the family physician or to other clinics or hospitals in the community, since it is considered outside the province of a dental infirmary to provide intensive or prolonged medical treatment. The examination includes appraisal of the general appearance; posture; musculature; size and shape of head; width and height of dental arch; presence or absence of enlargement of joints and of rachitic rosary, Harrison's groove or other deformity of the chest; eyes, for conditions such as strabismus or blepharitis; nose and throat; glands, especially cervical, and heart and lungs.

An attempt was made to give each child in groups 1 and 2 at least one such examination during the course of the study, but 3 children in group 1 failed to report for this part of the procedure. One child in group 1 was found to be under medical treatment for paralysis of the facial nerve following mastoidectomy, and 1 in group 2 was under treatment for a rheumatic cardiac condition. Nine children were referred elsewhere for further examination and treatment: 3 in group 1 and 4 in group 2 for ocular examination; 1 in group 2 for a basal metabolic test because of suggestive signs of endocrine disturbance, and 1 in group 2 for a blood count, a urinalysis, tests for syphilis (Wassermann, Hinton and Kahn), and examination of the ears because of a history of pain

and vomiting, no explanation of which could be found in the physical examination. Reports for the last 2 children stated that results of the examinations were negative.

Other findings are summarized in table 6. The fact that none of the children in group 1 as compared with 50 per cent of those in group 2 showed evidence of old rickets seems most significant. It is apparent that obesity, poor musculature and poor posture, which are generally recognized as indications of poor nutrition, past or present, occurred with greater frequency among children of group 2. Nervous manifestations were noted in 39 per cent of the children of group 2 but in no child of

TABLE 6.—*Comparison of Conditions Observed at Medical Examinations of the Children of Groups 1 and 2*

	Group 1,* %	Group 2, %
No pathologic condition	55	6
Evidence of old rickets	0	50
Obesity	9	17
Poor musculature	9	39
Poor posture	18 †	11
Hypertrophied tonsils	27	33
Deflected septum	0	11
Blepharitis	0	17 ‡
Nervous manifestations §	0	39
No defect	55	6
One defect	9	28
Two defects	27	28
Three defects	0	22
Four defects	0	11
Five defects	0	6

* Three members of group 1 failed to report for a physical examination. The percentages refer only to the number of children examined (11).

† In these 2 cases the physician considered poor posture to be related to defective vision. Musculature was good.

‡ The dietary histories of 2 of the 3 children with blepharitis suggested vitamin A deficiency as the possible cause of this condition.

§ The following nervous manifestations were noted during the examination or were reported by the mothers: extreme restlessness, irritability, chronic worry, poor sleep habits, nail biting and nocturnal enuresis.

group 1. Furthermore, considerable difference will be observed in the number of defects per child in the two groups.

Present Dietary Habits.—An examination into the present diet of the child was next made. A report of the kinds and amounts of foods eaten for the twenty-four hours previous to the visit to the clinic was taken on each of several interviews, and the mother's statement as to the usual daily and weekly consumption of various foods was recorded and rechecked. The mother was encouraged to discuss freely her habits of food purchasing, food preparation and meal planning so that a clear conception of the family diet might be obtained. In several instances it was possible to procure a record of the grocery order for one week. The food likes and dislikes of the child and of the other members of the family were considered. Attention was also directed toward conditions which may directly or indirectly affect appetite and utilization of food,

such as habits of sleep and rest, elimination, regularity of meals, social activities, attitude toward school, home responsibilities and family relations. Whenever feasible the child was interviewed alone, so that his statements and comments might amplify his mother's. This method of careful examination into the dietary and the daily regimen is accepted as one means of assessing the child's present nutritional state.[4] The assembled data were studied with respect to the proportion of total daily calories taken in the form of protective foods.

The term "protective," originally introduced by McCollum,[5] has come into wide and popular usage in relation to food groups which are now known not only to protect against actual deficiency but to promote positive or buoyant health through their enrichment of the diet in minerals and vitamins. Laboratory and clinical evidence as to the general advantages which result from increasing the prominence of protective foods was cited by Sherman,[6] who made the following two suggestions as a means of guidance in the selection of an adequate dietary: (1) that at least half of the needed food calories be taken in the form of protective foods, which he classifies as milk and its products, fruits, vegetables and eggs, and (2) that at least half of the breadstuffs and other cereal or grain products eaten be in the "whole grain" forms. Sherman added that he considered the second suggestion to be much less important than the first but to constitute a desirable added feature for all persons except those few who are under definite medical advice to the contrary. These two suggestions have been selected as useful criteria in assessing the adequacy of the diets in groups 1 and 2. On the basis of the twenty-four hour intake and the data collected by the methods described, the percentage of the total calories which each child customarily took in the form of protective foods [7] was secured. A survey of the type of breadstuffs and cereal products was made.

The diets of 57 per cent of the children in group 1 but of only 11 per cent of those in group 2 were adequate in respect to both recommenda-

4. Roberts, L. J.: Nutrition Work with Children, ed. 2, Chicago, University of Chicago Press, 1935. Boudreau, F. G.: Co-Ordination of Research in Home Economics with Public Health in the Field of Nutrition, J. Home Econ. **30**:677 (Dec.) 1938.

5. McCollum, E. V.: The Newer Knowledge of Nutrition, ed. 2, New York, The Macmillan Company, 1922.

6. Sherman, H. C.: Chemistry of Food and Nutrition, ed. 5, New York, The Macmillan Company, 1937.

7. It should be stated that in the publications of the technical commission on nutrition of the League of Nations (The Problem of Nutrition: Report on the Physiological Bases of Nutrition, Boston, World Peace Foundation, 1936, vol. 2) a slightly different classification has been used for protective foods, glandular tissues, fish and muscle meats being added to the foregoing list; but for the purpose of this paper the protective foods have been considered those so designated by Sherman.

tions of Sherman. The percentage distribution of the calories supplied by protective foods is given in table 7, which shows that 92 per cent of the diets in group 1 as compared with 34 per cent of the diets in group 2 fell into the excellent or good category in respect to protective foods.

The customary daily consumption of milk, fruits, vegetables and eggs was next studied in terms of servings. The consumption of each of these protective foods was consistently higher in group 1 than in group 2, with the difference in relation to milk and raw vegetables most striking. Seventy-nine per cent of the children of group 1 but only 33 per cent of those of group 2 consumed more than 1½ pints (700 cc.) of milk daily. Seven per cent of group 1 as compared with 50 per cent of group 2 consumed less than 1 pint (470 cc.) of milk daily. Seventy-two per cent of group 1 ate raw vegetables daily or often, whereas only 11 per cent of group 2 ate them with equal frequency. The figure for

TABLE 7.—*Comparison of Percentages of Calories Supplied by (1) Protective Foods and (2) Adhesive Carbohydrates in Groups 1 and 2*

Percentage of Calories Supplied	Group 1	Group 2
By protective foods		
50 or above (excellent)	71	17
50 to 40 (good)	21	17
40 to 25 (fair)	0	61
Below 25 (poor)	7	6
By adhesive carbohydrates		
50 or above (excessive)	7	28
50 to 40 (considerable)	7	39
40 to 25 (moderate)	21	17
Below 25 (slight)	64	17

consumption of raw vegetables refers exclusively to the months of this phase of the study (January-April inclusive), although several mothers in both groups stated that they served more vegetable salads in summer than in winter. There was a noticeable tendency for the number of servings of citrus fruits and cooked vegetables other than potato to be larger in group 1 than in group 2. The size of the servings was also larger in group 1. Several of the mothers of children in this group stated that the child had a water glass full of orange, grapefruit or tomato juice each day, but no mother in group 2 reported a larger container than a "cheese glass" (3 to 4 ounces [89 to 118 cc.]). In the case of cooked vegetables, the mothers in group 1 frequently commented that the child was very fond of vegetables, preferring them to meat or dessert. Only one mother in group 2 made a similar statement, while several reported that vegetables were often refused. Such desirable habits as the eating of baked potato skins and the use of water in which vegetables had been cooked were mentioned with far greater frequency for children of group 1.

Vitamin D Supplements.—A difference between the two groups was noted with respect to the administration of vitamin D supplements in that 43 per cent of the children of group 1 as compared with 83 per cent of those of group 2 had none during the winter of the study. Twenty-one per cent of group 1 and 11 per cent of group 2 took cod liver oil daily in amounts ranging from 1 to 3 teaspoonfuls. The remaining 36 per cent of group 1 and 6 per cent of group 2 took it intermittently. Consideration of the data regarding the consumption of cod liver oil or its equivalent during previous winters indicated no apparent difference in the two groups. Twenty-one per cent of group 1 and 11 per cent of group 2 had never taken a vitamin D supplement of any nature.

Carbohydrate Consumption.—Because of the causative relation which sweets are often considered to bear to dental caries, an attempt was next made to determine the amount of candy and sugar in the present

TABLE 8.—*Comparison of Consumption of Between-Meal Carbohydrates of Groups 1 and 2*

Consumption	Candy		Sugar		Bread, Crackers, Cookies or Cake Between Meals	
	Group 1, %	Group 2, %	Group 1, %	Group 2, %	Group 1, %	Group 2, %
Excessive (large amount daily)	7	22	0	22	7	50
Considerable (small amount daily)	36	0	7	6	21	0
Moderate (small amount several times a week)	28	50	50	72	29	22
Slight (small amount seldom)	29	28	43	0	43	28

diets of the children. Each mother and child was questioned minutely as to the ingestion of these foods, and the data were rechecked by various methods on subsequent visits. A survey was also made of the customary between-meal consumption of articles other than candy. These were found to be almost exclusively starchy foods; namely, bread (often spread with jam), crackers, cookies and cake, which were eaten with descending frequency in the order listed. This information is classified in table 8, where it will be observed that the percentage of children consuming excessive amounts of candy, sugar and starchy foods between meals is notably higher in group 2 than in group 1, but that an appreciable percentage of group 1 (64 per cent for candy, 57 per cent for sugar and 50 per cent for starchy foods between meals) falls into the classification of considerable or moderate consumption. There was a perceptible tendency on the part of the mothers in group 1 to control the consumption of candy by distributing a small amount regularly or frequently but not allowing the children to buy or eat it haphazardly. In group 2 it was common practice to give spending money or to permit the children to

accept sweets as gifts. Consumption of candy was, therefore, more likely to exert an adverse effect on the appetite of the children in group 2 than on those in group 1.

Notations were made regarding appetite throughout the series of conferences. Final judgment was based on the following factors as well as on the mother's and child's own appraisal: total amounts and kinds of food eaten, meal spacing, length of meal period, food likes and dislikes, frequency of food refusal, parental management at meal time, amount of nervous stimulation and fatigue. Eighty-six per cent of group 1 and 39 per cent of group 2 were rated excellent or good in relation to appetite. Fourteen per cent of group 1 and 61 per cent of group 2 were rated poor or capricious.

Some means of expressing the total consumption of adhesive carbohydrate foods seemed desirable. On the basis of the twenty-four hour intake and the data collected by the methods described, the percentage of the total calories which each child customarily took in the form of sticky carbohydrate foods was secured. The following foods were included in this classification: sugar, jam, candy, syrup, marshmallow cream, crackers, cookies, cake, pastry, doughnuts, white bread and refined cereals. Whole grain breads and cereals were omitted because of their relatively coarse texture. The percentage of the total calories which these adhesive carbohydrates supplied in the diets of the two groups is shown in table 7. An inverse relation between the consumption of protective foods and of adhesive carbohydrates will be observed. As previously noted, the consumption of protective foods is classified as excellent or good in 92 per cent of group 1 but in only 34 per cent of group 2, whereas the consumption of adhesive carbohydrates is classified as excessive or considerable in only 14 per cent of group 1 but in 67 per cent of group 2.

Chart 3 depicts the individual consumption of protective foods and of adhesive carbohydrates, showing clearly the tendency toward this inverse relation. It will be observed that in no instance in which the calories from protective foods constitute 50 per cent or more of the total calories is the percentage of adhesive carbohydrate foods above 27. In the majority of such cases the percentage of adhesive carbohydrate foods is below 20. Conversely, in no instance in which the calories from adhesive carbohydrate foods constitute 30 per cent or more of the total calories is the percentage of protective foods above 47. In the majority of such cases the percentage of protective foods is below 40.

Economic Status and General Health Rating.—The question of difference in economic status between the two groups should be raised in connection with the quality of the dietary. At the time of the study the total weekly income in group 1 ranged from $13.75 to $40, with an average per capita figure of $5. The total weekly income in group 2

ranged from $8.50 to $38, with an average per capita figure of $4.60. Thus it may be assumed that the amount of money available for food expenditure was approximately the same in the two groups. The noteworthy difference was rather in the interest and intelligence with which

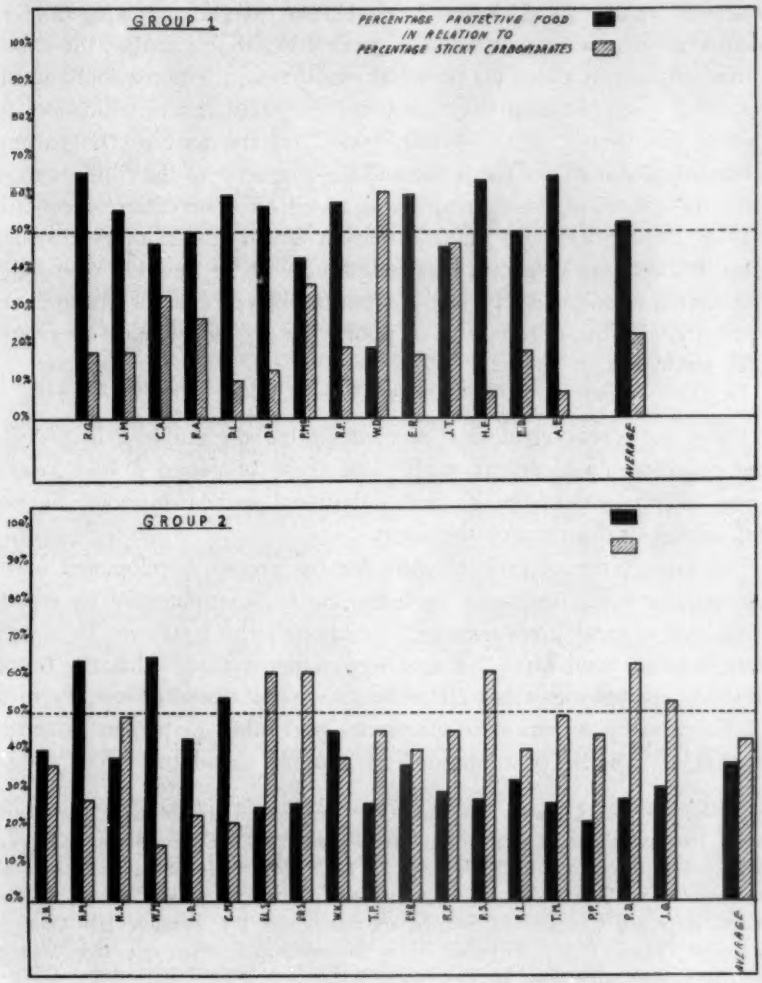

Chart 3.—Percentage of protective food in the diet in relation to the percentage of sticky carbohydrates for (group 1 and group 2).

the money was administered. This observation is in accord with the findings of a recent extensive investigation of family diets in the United States,[8] in which wide differences were noted in the quality of diets

8. Steibling, H. K., and Phipard, E. F.: Diets of Families of Employed Wage Earners and Clerical Workers in Cities, Circular 507, United States Department of Agriculture, 1939.

obtained for the same expenditure of money. During the whole course of this study a keen awareness of health responsibilities was much more apparent in the mothers of group 1 than in those of group 2. In order to give concrete expression to this difference, a rating scale similar to those used for the pregnancy and for the history of infancy was devised. Numerical values were assigned in relation to the following factors, which were considered indicative of general health standards: the child's habitual amount of sleep, his personal cleanliness, the household routine, the mother's use of community resources for public health education, the presence or absence of "food finickiness" on the part of the parents, the emotional stability of the home and the character of the child management. Judgment of these factors was based on observation during the series of conferences and on information which the mothers revealed. Eighty-six per cent of group 1 as compared with 45 per cent of group 2 rated excellent or good (10 to 6), whereas 14 per cent of group 1 and 55 per cent of group 2 rated fair or poor (5 to 0) with respect to general health standards.

COMMENT

From the foregoing data it is evident that the children in group 1 rated considerably more favorably than those of group 2 with respect to oral health, general health and nutritional standards from the prenatal period to the time of the study.

The importance of prenatal care for the proper development of the teeth and for their resistance to dental caries is emphasized by experimental and clinical investigations.[9] Although the teeth are to a great extent calcified after birth,[10] it has been demonstrated [11] that the formation of the enamel organ as well as the subsequent dental development can be influenced by nutritional deficiencies and other disturbances during pregnancy. Recent examinations of erupted deciduous teeth [12] have

9. Toverud, K. U., and Toverud, G.: Studies on the Mineral Metabolism During Pregnancy and Lactation and Its Bearing on the Disposition to Rickets and Dental Caries, Acta pædiat. (supp. 2) **12**:1, 1931. Mellanby, M.: Diet and the Teeth: III. The Effect of Diet on Dental Structure and Disease in Man, Medical Research Council, Special Report Series, no. 191, London, His Majesty's Stationery Office, 1934. Toverud, G.: Die pränatale Fürsorge des Gebisses, Deutsche Jugendzahnpflege **25**:45 (Sept.) 1937.

10. Hess, A. F.; Lewis, J. M., and Roman, B.: A Radiographic Study of Calcification of the Teeth from Birth to Adolescence, Dent. Cosmos **74**:1053 (Nov.) 1932. Logan, W. H. G., and Kronfeld, R.: Development of the Human Jaws and Surrounding Structures from Birth to the Age of Fifteen Years, J. Am. Dent. A. **20**:379 (March) 1933.

11. Toverud, K. U.; Häupl, K., and Toverud, G.: Röntgenologische und histologische Untersuchungen über die Zähne und Kiefer neugeborener Kinder, Norske Tannlægeførenings Tidende, May-June 1934, vol. 43.

12. Rushton, M. A.: The Birefringence of Deciduous Tooth Enamel Formed Before and After Birth, Brit. Dent. J. **67**:1 (July) 1939.

furthermore indicated that enamel formed before birth is neither so homogeneous nor as well calcified as has been previously reported [13] and therefore may influence the rate of dental caries.

In the present study the hypoplasia in the enamel most noticeable clinically was found in 2 prematurely born children in that part of their deciduous teeth which presumably was in the process of calcification at the time of delivery. This is in keeping with histologic evidence that those striae of Retzius which correspond to the so-called "birth-lines" [14] are accentuated to the point of significant defects in the enamel in children of premature birth.[15] The association of these birth lines with the event of birth has lately been extensively studied, the lines being termed "neo-natal rings." [16]

The exanthematous diseases of early childhood are considered in the textbooks [17] a frequent cause of hypoplasia of the enamel. Such a correlation was not found in this study when the calcification time [18] of the affected areas was compared with the time of occurrence of these diseases. This clinical finding seems supported by results of recent animal experiments [19] in which an artificially produced fever in rats did not seem to give rise to hypoplasia in the developing enamel. In the dentin, however, pathologic changes were produced, a result which has also been shown by artificially induced hyperpyrexia in rabbits.[20] Considering the universal spread of exanthematous diseases in modern communities, it would seem that only repeated attacks of these diseases, followed by protracted nutritional deficiencies, are conducive to the production of significant defects in the enamel. From the foregoing observations one may conclude, however, that the exanthematous dis-

13. Kronfeld, R., and Schour, I.: Neonatal Dental Hypoplasia, J. Am. Dent. A. **26**:18 (Jan.) 1939.

14. Rushton, M. A.: Fine Contour-Lines of Enamel of Milk Teeth, Dent. Rec. **53**:170, 1933.

15. Stein, G.: Schmelzschäden am Milchgebiss und ihre klinische Bedeutung, Ztschr. f. Stomatol. **34**:843, 1936.

16. Schour, I.: Neonatal Line in Enamel and Dentin of Human Deciduous Teeth and First Permanent Molar, J. Am. Dent. A. **23**:1946 (Oct.) 1936. Schour, I., and Kronfeld, R.: Tooth Ring Analysis, Arch. Path. **26**:471 (Aug.) 1938.

17. Black, G. V.: A Work on Operative Dentistry, ed. 6, Chicago Medico-Dental Publishing Company, 1924, vol. 1. Bunting, R. W.: Oral Pathology, Philadelphia, Lea & Febiger, 1929. Brauer, J. C.; Higley, L. B., and Boyd, J. D.: Dentistry for Children, Philadelphia, P. Blakiston's Son & Co., 1939.

18. The charts of C. F. Bödecker (cited by McBeath, E. C.: New Concept of the Development and Calcification of Teeth, J. Am. Dent. A. **23**:675 [April] 1936) were used as the standard. Bödecker's charts were adapted from observations by Logan and Kronfeld.

19. Garrison, L. H.: The Effect of Fever on the Development of the Rat Incisors, personal communications to the authors.

20. Berman, M.; Edward, L. F., and Kitchin, P. C.: Effect of Artificially Induced Hyperpyrexia on Tooth Structure of Rabbits, Proc. Soc. Exper. Biol. & Med. **41**:113 (May) 1939.

eases to some extent account for the frequently found imperfections in the dentin, which, in turn, may be a factor in the rapid progress of dentinal caries. That imperfectly formed teeth offer less resistance to the progress of caries than properly formed teeth was suggested as early as 1890.[21] However, approximately thirty years elapsed before this apparently logical conception was supported by a scientific investigation.[22] For the reasons stated earlier in this paper, only group 1 offered an opportunity to correlate the relation between hypoplasia and caries in the course of this investigation. As previously noted, the hypoplastic teeth appeared more susceptible to decay than the nonhypoplastic teeth. In this connection it should be stated that the deciduous dentition in the children studied had a higher posteruptive age than the permanent.

It is generally accepted that the period of infancy and childhood is of utmost importance for the proper formation of the teeth and their surrounding tissues. Attention has been called to the first permanent molars, which are calcified during this period. Without doubt the occlusal surfaces of these teeth, the cusps of which begin to unite at the sixth and seventh month of life,[23] are, in general, the most frequently decayed part of the human dentition. Modern living has brought about most striking changes in nutritional practices of infancy and in oral conditions. Possibly these changes are best exemplified by the lack of breast feeding on the one hand and by the defective first permanent molars on the other. In the primitive community of Tristan da Cunha one of us [24] recently found that the mothers nursed their babies a year or more and that no person below 30 years of age had evidence of progressive caries in the first permanent molars. As the diet of these people is of a soft consistency (mainly potatoes and fish), this remarkable freedom from decay cannot be attributed to any significant attrition of the occlusal surfaces, as seen in other primitive peoples.

It has been shown that only the children of group 2 had evidence of marked malocclusion (34 per cent) and malformed palate (56 per cent). That most of the patients referred to also had evidence of old rickets may be associated with these disorders. It is appreciated that the development of the jaws is under the influence of so many factors during infancy and childhood that it is rather difficult to trace the primary causes of oral malformations when studying the older child. Any or all of such factors as heredity, birth trauma, nutritional aberra-

21. Miller, W. D.: The Micro-Organisms of the Human Mouth, Philadelphia, S. S. White Dental Manufacturing Company, 1890.

22. Mellanby, M.; Pattison, C. L., and Proud, J. W.: The Effect of Diet on the Development and Extension of Caries in the Teeth of Children, Brit. M. J. **2**:354 (Aug. 30) 1924.

23. Kronfeld, R.: First Permanent Molar: Its Condition at Birth and Its Postnatal Development, J. Am. Dent. A. **22**:1131 (July) 1935.

24. Sognnaes, R. F.: Recent Dental Study of the Inhabitants in Tristan da Cunha, unpublished data; abstracted, J. Dent. Research **18**:245 (June) 1939.

tions and habits of early life [25] may have played a part. Ramaker [25a] has recently shown in an exhibit for the American Dental Association that the development of the jaws is influenced by the mechanism of breast feeding to a greater degree than has been commonly recognized. In our series 2 of the children with high palate also had deflected nasal septums and hypertrophied tonsils, accompanied by breathing difficulty. Such chronic inflammations of the nose and throat, as well as mouth breathing, are frequently looked on as causes of malocclusion. Experiments [26] with animals have indicated, however, that these conditions are rather secondary, being due to constricted nasal architecture, narrowed arch and protruded anterior teeth, which, in turn, have been brought about by protracted mineral and vitamin deficiency. In view of the fact that considerable evidence of poor nutrition, past and present, has been demonstrated in group 2, nutritional faults may be considered one of the primary factors in the development of the oral malformations of these children.

Certain oral lesions were apparently of more recent origin, such as the chalklike initial lesions in the enamel and the inflammations of the gingival margin. The latter condition was especially noticed where the position of the teeth caused traumatic pressure on the interdental papillae, owing to crowded anterior teeth. It was found, however, that such a disarrangement of the teeth was less predisposing to inflammation of the gums in group 1 than in group 2. As a deficiency of ascorbic acid is considered an etiologic factor in gingivitis, the more frequent use of citrus fruit and vegetables in group 1 may explain this difference in susceptibility to gingival inflammations. The only more generalized gingivitis occurred in a 10 year old girl with mesial occlusion, 1 of 3 children who had no citrus fruit during the period of the study.

The acute disintegrations of the white enamel that were found in group 2 are considered a significant manifestation of present disease. Frequently wide areas of the so-called "self-cleansing" smooth surfaces were attacked. It should be mentioned that in 7 of the children with these disorders a nervous disposition was noticeable. Although some observers [27] have directed attention toward the significance of a nervous

25. (*a*) Ramaker, R. E.: Malformations of the Dental and Nasal Structure, Arising During Birth, with Suggestion for Their Treatment, read at the Eighty-First Annual Session of the American Dental Association, Milwaukee, July 17-21, 1939. (*b*) Levy, D. M.: Thumb or Finger-Sucking from the Psychiatric Angle, Angle Orthodontist **7**:100 (April) 1937. (*c*) Toverud, G.: Preventive Dentistry in the Pre-School Period, Dent. Mag. & Oral Topics **55**:1 (April) 1938.

26. Howe, P. R.: The Interpretations of Dental Lesions in the Light of Recent Research, J. Dent. Research **7**:145, 1927; Nutrition and Bone Growth, Angle Orthodontist **8**:209 (July) 1938.

27. (*a*) Howe, P. R.: Dental Caries, Dental Cosmos **62**:921 (Aug.) 1920. (*b*) Briggs, E. F.: Emotions as the Controlling Factor in Dental Caries, Harvard Dent. Rec. **13**:1 (Oct.) 1938.

factor in relation to dental caries, no further investigations into this matter have been pursued. It is evident from experiments with animals,[28] however, that emotions have a marked influence on the digestion and the secretion of saliva. Metabolic studies have demonstrated that even a relatively adequate intake of food is insufficient to insure protection to the teeth when incompletely utilized.[29] The nervous manifestations noticed in group 2 may be another sign of faulty nutrition or may, on the other hand, be a result of emotional stress brought about by the habits of life in modern communities, which secondarily may influence the utilization of foods. Probably in favor of the last view are studies of certain primitive people [24] who seem to maintain general and dental health on a diet that does not always correspond to our modern conception of nutritional requirements.

During the past few years both clinical and laboratory investigations [30] indicate that nutrition (in the broadest sense of the word) is a controlling factor in dental caries. This view is upheld by the study here reported and by similar investigations.[31]

One of the most discussed factors relative to dental caries concerns the excessive use of refined carbohydrates, especially sugar, in modern diets.[32] Although fifty years has elapsed since the relation between excessive use of carbohydrates and dental caries was first intelligently investigated,[21] there is still little agreement as to the mechanism by which such an effect may take place. The difference in the use of adhesive carbohydrates in groups 1 and 2 has been noted. But it is evident that the diet of the children in group 1 is decidedly more adequate than that of the children in group 2. This inverse relation between the calories supplied by protective foods and refined carbohydrates (chart 3) is apparent to all specialists in nutrition when they study the home dietaries of large numbers of children. Persons who eat inordinate amounts of sweets and "between-meals carbohydrates" have

28. Cannon, W. B.: Bodily Changes in Pain, Hunger, Fear and Rage, ed. 2, New York, D. Appleton and Company, 1929.

29. Drain, C. L., and Boyd, J. D.: The Control and Arrest of Dental Caries: An Institutional Study, J. Am. Dent. A. **22**:155 (Jan.) 1935.

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32. Bunting, R. W., and Palmerlee, F.: The Role of Bacillus Acidophilus in Dental Caries, J. Am. Dent. A. **12**:381 (April) 1925. Jay, P.: Lactobacillus Acidophilus and Dental Caries, Am. J. Pub. Health **28**:759 (Aug.) 1938.

neither the desire nor the capacity for large servings of food of high nutritive value.

Extensive experiments with animals carried out in this institution [33] have demonstrated that a mixture of adhesive carbohydrates as well aciduric micro-organisms directly applied to the teeth were not conducive to dental caries. Caries-like lesions were, on the other hand, produced by protracted mineral and vitamin deficiencies.

It is obvious from the foregoing observations that the oral disorders of the children in group 2 of this study were not confined to extensive dental caries, on the basis of which the children were selected. Their oral cavities presented a whole complex of pathologic manifestations as compared with the healthful oral conditions of the children in group 1. Throughout the entire history of the children it was furthermore evident that the children of group 1 had enjoyed a more favorable general health and nutritional state than those of group 2. This investigation, therefore, strongly supports the contention that a sound oral condition is the accompaniment of a sound body.

SUMMARY

A study has been made of two groups of infirmary outpatients aged 4 to 13 years, selected entirely on the basis of their freedom from (group 1) and high frequency of (group 2) dental caries.

A detailed dental examination revealed that the oral cavities of the children in group 2 presented a complex of pathologic manifestations, including inflammation of the gums, malformations of the jaws and irregularities of the teeth, as compared with the sound oral conditions of the children in group 1.

A medical and nutritional study of the children showed that group 1 rated more favorably than group 2 with respect to prenatal and infancy histories, physical condition, adequacy of present diet, appetite and general health standards.

The findings are in accord with results obtained from other group studies of children, suggesting that oral conditions may be regarded as symptomatic of the general health state of the body.

Percy R. Howe, D.D.S., D.Sc., director of the Forsyth Dental Infirmary, gave encouragement and advice throughout the study. Florence B. Hopkins, M.D., D.M.D., of the Division of Child Hygiene of the Massachusetts Department of Public Health, conducted the physical examinations and assisted in the preparation of the medical and nutritional data.

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BULLOUS SCHICK REACTIONS

THEIR OCCURRENCE DURING ACUTE INFECTIOUS DISEASES

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Positive Schick reactions which become bullous have been described in the medical literature. Schick [1] stated that such reactions were seen occasionally in very "susceptible individuals" who had no diphtheria antitoxin in the blood. Dudley [2] mentioned a rare type of Schick reaction "which vesiculates and produces a shallow ulcer of the skin." Griffith and Mitchell's textbook [3] has an illustration of a bullous reaction which, it is stated, occurs "occasionally in individuals who have practically no antitoxin." However, no studies of the antitoxin content of the blood of patients having these bullous reactions have been recorded. Young and his co-workers,[4] who studied Schick reactions in adults, mentioned necrosis and vesiculation but were unable to discover the significance of such tissue reactions or to correlate them with an unusually low titer of antitoxin. Cooke and Sharma,[5] who performed over 600 Schick tests on newborn infants and their mothers, did not mention the occurrence of vesiculation in any of their patients but stated

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From the Pediatric Service and Laboratories of Mount Sinai and Willard Parker Hospitals and the Bureau of Laboratories of the New York City Department of Health.

1. Schick, B.: Diphtherie, in von Pfaundler, M., and Schlossmann, A.: Handbuch der Kinderheilkunde, ed. 4, Leipzig, F. C. W. Vogel, 1931, vol. 2, p. 10.

2. Dudley, S. F.: Human Skin Tolerance to Diphtheria Toxin and Immunizability, Brit. J. Exper. Path. **12**:319 (Oct.) 1931.

3. Griffith, J. P. C., and Mitchell, A. G.: The Diseases of Infants and Children, ed. 2, Philadelphia, W. B. Saunders Company, 1937, fig. 67 (*a*), p. 324.

4. Young, C. C.; Bunney, W. E.; Crooks, M.; Cummings, G. D., and Forsbeck, F. C.: Diphtheria Studies: The Significance of the Schick Test in the Adult, Am. J. Pub. Health **24**:835 (Aug.) 1934.

5. Cooke, J. V., and Sharma, B. M.: Schick Test in the Newly Born, Am. J. Dis. Child. **44**:40 (July) 1932.

that when mother and infant each had a positive reaction that of the mother was stronger though the antitoxin content was the same. Benjamin, Fleming and Ross [6] tested over 5,000 normal children and did not obtain a single bullous response.[7] The only reference to the fact that bullous reactions may occur when the Schick test is performed during the course of an acute infectious disease is in a thesis by Dickinson,[8] who performed 1,091 Schick tests, of which 730 were done during acute illnesses. Dickinson stated that 3 of the reactions became vesiculated, all in patients with scarlet fever, but he did not comment on their significance. None of 361 tests done on well persons caused a bullous reaction.

Several authors have noted that the incidence of positive Schick reactions seemed to be higher in the acute infectious diseases. Zingher [9] found that Schick reactions were more frequently positive when the test was performed during illnesses such as poliomyelitis, scarlet fever and measles than when performed on well children, but he made no reference to the character and intensity of the reactions. Armstrong [10] also commented on this fact and expressed the belief that the high percentage of children susceptible to diphtheria who had poliomyelitis might indicate a lack of general immunity to other infections. Harrison [11] could not confirm Zingher's results when he compared reactions in a group of patients with poliomyelitis with those of a control group. Finkelstein, Wilfand and Chochol [12] found that negative Schick reactions in infants became positive three weeks after smallpox vaccination. They called the changed reaction a "parallergie," previously described by Moro and Keller.[13] The positive reactions were not bullous.

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6. Benjamin, B.; Fleming, G., and Ross, M. A.: Results of Schick Tests in 5,195 Children Given Injections of Diphtheria Toxoid, Am. J. Dis. Child. **55**:51 (Jan.) 1938.

7. Benjamin, B.: Personal communication to the authors.

8. Dickinson, T. E.: The Schick Test for the Determination of Susceptibility to Diphtheria, Thesis, Victoria University of Manchester, 1921; Schick Test, Lancet **1**:312 (Feb. 18) 1922.

9. Zingher. A.: The Schick Test in Poliomyelitis, Scarlet Fever, Measles and in Normal Children, Am. J. Dis. Child. **13**:247 (March) 1917.

10. Armstrong, C. A.: Postvaccination Encephalitis, with Special Reference to Prevention, Pub. Health Rep. **47**:1553 (July 22) 1932.

11. Harrison, W. T., cited by Armstrong.[10]

12. Finkelstein, L. O.; Wilfand, R. A., and Chochol, E. N.: Reaction von Schick und Kuhpockenimpfung, Ztschr. f. Kinderh. **45**:258, 1928.

13. Moro, E., and Keller, W.: Tuberkulose Hautallergie nach intracutaner Simultanimpfung von Tuberkulin und Kuhpockenlymphe, Deutsche med. Wchnschr. **51**:1015 (June 19) 1925.

Our interest in the bullous reaction was stimulated during the outbreak of poliomyelitis in 1935, when it was noted [14] that Schick tests made in the acute stage of the disease sometimes produced bullous results. Such results were so unusual that we decided to observe all Schick reactions for the development of bullae, the Schick test being made routinely on children admitted to the pediatric wards of the Mount Sinai Hospital and the Willard Parker Hospital.

METHOD AND MATERIAL

The Schick tests were made on the left arm with 0.1 cc. of various batches of diluted diphtheria toxin ordinarily used for Schick tests from the Department of Health of the City of New York. The test materials were used simultaneously on many other patients and produced negative or positive Schick reactions of the normal type. Control tests with 0.1 cc. of heated toxin were made at the same time on the right forearm of about half of the patients tested. Both the toxin and the heated toxin were used concurrently on other patients and were adequately tested for their reliability. Observations were made for five consecutive days. Nearly all of the children tested were over 1 year of age. A reaction was considered bullous when the center of an apparently positive reaction became elevated after two days and blistered on the fourth or fifth day, as shown in the accompanying illustration. The whole area subsequently became pigmented, as in the usual positive Schick reaction. Occasionally the bleb replaced the entire reaction, remaining four or five days until the clear fluid was absorbed or rupturing spontaneously. Aerobic and anaerobic bacterial cultures of this fluid were sterile. In a number of patients whose Schick tests produced bullous reactions, control tests were made simultaneously with a neutralized mixture of toxin and antitoxin. Neither the reactions to these control tests nor the reactions to the usual control test in which heated toxin was used ever became bullous. Dick tests were also made on the patients at the Willard Parker Hospital. None of the reactions to these tests became bullous.

RESULTS

It was noted that bullous Schick reactions occurred not only in patients with poliomyelitis but also in patients with other infectious diseases, such as pneumonia, measles, scarlet fever, pertussis, meningococcic meningitis and erysipelas. The bullous reaction was seen most often in patients with pneumonia. Twenty-two bullous reactions developed in 126 patients with this disease admitted to the pediatric service at the Mount Sinai Hospital during a twelve month period. In one group of 250 patients with measles at the Willard Parker Hospital, 10 bullous reactions were noted (table 1). On the other hand, only a single bullous reaction was seen among all the patients over 1 year of age who were admitted to the pediatric wards with afebrile ailments during the past three years. That reaction was elicited in a child with renal rickets, who had marked azotemia and retention of phosphate.

14. Fischer, A. E., and Stillerman, M.: Acute Anterior Poliomyelitis in New York in 1935: A Review of Six Hundred and Eighty-Six Cases, Am. J. Dis. Child. **54**:984 (Nov.) 1937.

She had not been previously immunized. This was the only child in whom a bullous reaction was noted without a coexistent infection. A number of ambulatory children with minor infections also were tested. None of their reactions became bullous. In addition, 50 adults ill with pneumonia were given the Schick test at the Harlem Hospital.[15] Forty-six reactions were negative, 3 were positive and 1 became vesiculated.

The children who had bullous reactions were retested shortly after the acute infection had subsided. Of the 22 patients with pneumonia who had a bullous response, 18 had negative reactions on retest, 1 again had a bullous reaction and 3 had the usual positive Schick reaction (tables 1 and 2). The 10 patients with measles who showed bullous

TABLE 1.—*Schick Test and Retests*

Disease	Acute Stage		Convalescence	
	Schick Tests	Bullous Reactions	Schick Retests	Bullous Reactions
Pneumonia	126	22	126	1
Measles	250	10	250	1
Meningococcic meningitis	2	1	2	0

TABLE 2.—*Schick Retests of Children Who Had Bullous Reactions*

Disease	Bullous Reactions	Retest During Convalescence		
		Positive Reactions	Negative Reactions	Bullous Reactions
Pneumonia	22	3	18	1
Measles	10	6	3	1
Meningococcic meningitis	1	0	1	0

reactions were also retested after recovery. Three reactions were negative, 6 were positive and only 1 became bullous on retest. One of the 2 patients with meningococcic meningitis who had a bullous reaction had a negative reaction when retested seven days later. The change in the Schick reaction obtained on the second test from that obtained during the acute illness prompted us to retest some of these children a third time. Six children who had first a bullous and then a negative reaction were retested after five months. Three of these patients now showed positive reactions but without bullae, and 3 continued to show negative reactions. The significance of these changed reactions will be discussed subsequently. A few typical case summaries follow:

REPORT OF CASES

CASE 1.—J. F., 6½ years old, was taken ill four days before being admitted to the Mount Sinai Hospital. The condition was diagnosed as lobar pneumonia.

15. Permission to include these results was given by Dr. Jesse G. M. Bullowa.

There was no history of diphtheria prophylaxis. The Schick test was done on admission, when the patient's temperature was 105 F. The reaction became bullous on the fourth day. Two days after the temperature had fallen by crisis, the Schick test was repeated, with an entirely negative reaction. The retest six months later produced a moderately positive reaction. The patient received no injections of toxin-antitoxin or toxoid in the interim.

CASE 2.—B. S., 8 years old, was admitted to the Mount Sinai Hospital with lobar pneumonia. The child was said to have received diphtheria toxin-antitoxin at the age of 6 years, but the result of the Schick test was not known. The Schick test done on admission, when the child's temperature was 105 F., produced a bullous reaction on the fourth day (figure). The test was repeated after the crisis, and the reaction was negative. Six months later a retest resulted in a moderately positive reaction. The patient received no injections of toxin-antitoxin or toxoid in the interim.

Photograph showing the bullous Schick reaction in B. S.

CASE 3.—E. C., 1½ years old, was admitted to the Mount Sinai Hospital with a diagnosis of bronchopneumonia. There was no history of diphtheria immunization. A Schick test done on admission, when the child's temperature was 100 F., produced a bullous reaction. The retest three days after the crisis produced an entirely negative reaction. The Schick test done six months later had a moderately positive reaction. The patient had received no injections of toxin-antitoxin or toxoid.

CASE 4.—S. F., 4 years old, was first admitted to the Mount Sinai Hospital because of hepatosplenomegaly. The reaction to a Schick test made on admission was faintly positive. The child was readmitted six months later with high fever and lobar pneumonia. The Schick test made on admission produced a bullous reaction three days later. After the child's temperature had dropped to normal, the test was repeated five days after the original test. The reaction was faintly positive, but no bullae formed. The patient had received no injections of toxin-antitoxin or toxoid at any time.

CASE 5.—T. S., aged 2½ years, was first admitted to the Mount Sinai Hospital when 14 months old, with pneumonia. The Schick reaction was negative at that time. At 21 months of age the child had a positive Schick reaction while at the Willard Parker Hospital for scarlet fever. He was given two doses of 1 cc. of

diphtheria toxoid at an eight day interval. At 24 months of age the child had a negative Schick reaction when readmitted for chickenpox. At 2½ years of age the child had a temperature of 105 F., an acute infection of the upper respiratory tract and possible pneumonia. The Schick reaction was bullous. The reaction to a control test was negative. One week later, when the child was afebrile, the retest showed a positive but not a bullous Schick reaction. Serum taken at the time of the bullous test and again one week later showed between 1/200 (0.005) and 1/300 (0.003) unit of antitoxin on each test (table 3).

RELATION OF BULLOUS REACTIONS TO PREVIOUS IMMUNIZATION AND TO PREVIOUS SCHICK TEST

Some of the children whose reactions became bullous gave a history of having received diphtheria toxin-antitoxin or diphtheria toxoid or of having had negative Schick reactions at some time prior to their admission to the hospital. Exact figures are not available because we were not always able to obtain reliable histories from parents. Members of the social service departments of the Mount Sinai Hospital and the Willard Parker Hospital confirmed the histories of immunization in some cases by making contact with clinics of the board of health, with welfare stations and with private physicians. Among 16 children with bullous reactions at the Willard Parker Hospital, 7 had received a series of injections of diphtheria toxoid and 1 had had clinical diphtheria. Eight had not been given any immunization against diphtheria. It was definitely determined that 5 patients had had a negative Schick reaction following immunization at some time prior to the Schick test which resulted in the bullous reaction. In other words, 5 children whom we knew were immune, as well as some others who must have had some degree of protection following a series of injections of toxoid, had lost their immunity completely if judged by the bullous positive reactions. As this seemed unlikely, a study was made of the antitoxin content of the serum of some of these and other children with bullous reactions.

ANTITOXIN CONTENT OF SERUM

The amounts of diphtheria antitoxin in the serum at the time of the appearance of the bullous reaction and at the time of the retest were studied in 19 patients and 2 controls, Jensen's modification of Römer's technic was used.[16] Tests were made in duplicate and were repeated when the readings were not clearcut. The results are shown in table 3. For the most part, relatively small amounts of antitoxin were found in the serum of each of these patients. But more important, it was also

16. Jensen, C.: Die intrakutane Kaninchenmethode zur Auswertung von Diphtherie-Toxin und Antitoxin, Acta path. et microbiol. Scandinav., 1933, supp. 14, p. 1.

TABLE 3.—*Data on the Antitoxin Content of the Serum*

Patient *	Age	Diagnosis	Date and Type of Schick Reaction During Acute Illness	Units of Diphtheria Antitoxin in Serum During Acute Illness; Date	Date and Reaction in Schick Retest During Convalescence with Normal Temperature	Units of Diphtheria Antitoxin in Serum During Convalescence; Date	Comment
O. C.	16 mo.	Pneumonia	11/16/36: Positive; bullous	No test made	11/24/36: Slightly positive; not bullous	No test made	Control test with toxin antitoxin, negative reaction
I. K.	9 yr.	Measles	5/14/37: Positive; slightly bullous	1/300; 5/17/37	5/18/37: Moderately positive	1/300; 5/21/37	Control tests with heated toxin, negative reaction
P. R.	3 yr.	Measles	5/14/37: Positive; slightly bullous	1/100; 5/17/37	5/18/37: Negative	<1/200 >1/100	Control tests with heated toxin, negative reaction
B. C.	11 yr.	Measles	5/14/37: Positive; bullous	1/200; 5/17/37	5/18/37: Moderately positive	1/200; 5/21/37	Control tests with heated toxin, negative reaction
A. S.	12 mo.	Pneumonia	4/ 3/38: Positive; bullous	Test unsatisfactory	4/14/38: Moderately positive	1/300; 4/14/38	No history of immunization
G. R.	9 yr.	Pneumonia	4/20/38: Strongly positive; slightly bullous	1/300; 4/26/38	5/ 4/38: Moderately positive	1/300; 5/ 4/38	
A. C.	9 yr.	Pneumonia	5/ 6/38: Positive; bullous	1/300; 5/10/38	Moderately positive	1/300; 5/26/38	No history of immunization
O. S.	8 mo.	Infection of the upper respiratory tract and diarrhea	5/ 8/38: Positive; bullous	1/300; 5/ 9/38 >1/100; 5/10/38	5/16/38: Negative	1/200; 5/16/38	No history of immunization
O. S.	15 mo.	Pneumonia	2/ 4/39: Positive; bullous	No blood	2/ 6/39: Negative	1/100; 2/ 8/39	No history of immunization
J. B.	3 yr.	Lipoid pneumonia	9/15/38: Strongly positive	No blood	9/30/38: Negative; occasional slight fever 10/12/38: Negative	1/300; 9/22/38 9/30/38 10/12/38	Transfusion, 9/20/38; no history of immunization
R. V.	2 yr.	Pneumonia	10/11/38: Strongly positive	No blood	10/24/38: Moderately positive	1/300; 10/24/38	Received 1 cc. of toxoid 5/7/37 and 5/21/37
I. O.	2 yr.	Pneumonia	10/16/38: Positive; bullous	1/200; 10/20/38	10/24/38: Slightly positive	1/300; 10/24/38	No history of immunization
J. M. C.	4 yr.	Pyelitis	10/13/38: Positive; bullous	No blood	10/21/38: Moderately positive	1/400; 10/20/38	No history of immunization
E. R.	1 yr.	Pneumonia	12/ 8/38: Positive; bullous	<1/50 >1/25; 12/13/38	12/17/38: Faintly positive	<1/50 >1/25; 12/19/38	Blood transfusion 12/10/38; received 1 cc. of toxoid 9/3/38
J. R.	20 mo.	Postpertussis pneumonia	12/12/38: Strongly positive; not bullous	No blood	12/28/38: Negative	<1/200 >1/100; 12/30/38	Blood transfusion 12/15/38; received 1 cc. of toxoid 2/10/38 and 2/24/38
P. B.	3 yr.	Chickenpox and pneumonia	1/23/39: Positive; bullous	<1/200 >1/100; 1/24/39	1/28/39: Positive; not bullous	<1/200 >1/100; 1/28/39	No history of immunization; control tests with heated toxin, negative reaction
H. F.	14 mo.	Pneumonia	1/28/39: Positive; bullous	No blood	2/ 6/39: Negative	<1/300 >1/200; 2/8/39	Received 1 cc. of toxoid 8/9/38 and 8/23/38
D. D.	1 yr.	Pneumonia	5/23/39: Positive; bullous	<1/200 >1/100; 6/1/39	6/12/39: Positive	<1/200 >1/100	Received 1 cc. of toxoid 4/8/39
M. A.	13 mo.	Pneumonia	6/ 1/39: Positive; bullous	1/200; 6/ 4/39	6/ 9/39: Slightly positive	1/200; 6/12/39	Received 1 cc. of toxoid 5/5/39 and 5/19/39
T. S.	2½ yr.	Tonsillitis and pneumonia (?)	8/14/39: Positive; bullous	<1/300 >1/200	8/21/39: Moderately positive	<1/300 >1/200; 8/21/39	Control test, negative reaction; Immunized 2/8/29 and 2/16/39
T. P.	9 yr.	Control	5/26/38: Negative	1/10; 5/26/38	.....	.....	.....
B. S.	8 yr.	Control	1/13/39: Negative	<1/25; 1/13/39	.....	.....	Immunized at 1 year of age

* A few of these patients were among those whose tests were summarized in tables 1 and 2.

demonstrated that although the cutaneous reaction changed, the amount of circulating antitoxin was not appreciably altered in those patients whose blood serum was studied twice (table 3).

INFLUENCE OF SCHICK TEST ON SUBSEQUENT SCHICK RETEST

In order to determine whether the amount of toxin used in the Schick test was sufficient to stimulate enough antitoxin to alter the cutaneous reactivity to a second test, about 30 children with noninfectious diseases, whose Schick reactions were positive but not bullous, were retested within ten days. With each test the reaction was again positive, and the intensity of the second reaction was unchanged. The retests demonstrated, therefore, that the amount of diphtheria toxin ordinarily used for the Schick test is insufficient to alter rapidly a positive Schick reaction or to stimulate the production of enough antitoxin to change a positive Schick reaction materially within ten days.

COMMENT

A bullous Schick reaction is a type which may occur when diphtheria toxin is injected intradermally during an acute febrile illness. While this reaction has been mentioned by others,[17] its predominant association with acute infectious diseases has not been emphasized heretofore. We have not seen this type of reaction in ambulatory patients who were afebrile and in good health. The bullous reaction, therefore, in no way interferes with the usual interpretation of the Schick test performed on normal healthy children. Bullous reactions had been observed previously in patients in our children's wards and were thought to be due either to the erroneous injection of a large amount of toxin or possibly to an unsterile injection. We have definitely eliminated both of these factors as an explanation of the bullous reactions. The bullous reaction could be elicited a second time in only 4 patients. Three reactions occurred in children who had persistent infections with fever, 1 child having otitis media following measles, 1 recurrent pneumonia and the other pertussis and pneumonia. (The data for this last-mentioned patient are not included in table 1.) The other child in whom a second bullous reaction was obtained had renal rickets, previously described. Her serum contained less than 0.01 ($\frac{1}{100}$) unit of antitoxin per cubic centimeter.

The bullous reactions occurred chiefly in patients who had small amounts of antitoxin in the serum. A few children (E. R. and O. S.), however, had more than 0.02 ($\frac{1}{50}$) and 0.01 ($\frac{1}{100}$) unit respectively (table 3). It is a striking fact that although the cutaneous reaction was bullous at first and on retest either moderately positive or entirely

17. Schick.[1] Dudley.[2] Griffith.[3] Young.[4] Dickinson.[8]

negative, the blood serum had about the same antitoxin content both times (table 3, patients I. K., B. C., O. S., D. D., M. A. and T. S).

Karasawa and Schick,[18] as well as Andrewes and his associates,[19] have shown that acute infectious diseases do not alter the amount of antitoxin circulating in the blood. Our titrations confirm these observations.

As we have shown, the toxin in a Schick test does not change the positive to a negative reaction within ten days. This is especially true when small amounts of antitoxin are present in the serum. Fraser and Halpern [20] showed that circulating diphtheria antitoxin can be increased within twelve days following a Schick test and a control test in which 0.001 cc. of diluted toxoid is used. They obtained an increase in a few patients who had relatively large amounts of antitoxin, but none in 4 patients who had less than 0.002 ($\frac{1}{500}$) unit per cubic centimeter of blood. Jones and Moss [21] found that young adults who had been immunized by combined diphtheria and tetanus toxoid rapidly increased their circulating antitoxin by a stimulating dose of tetanus toxoid and a Schick test with a control test of 0.001 cc. of diphtheria toxoid. The increase was no doubt due to the toxin in the Schick test and the small dose of diphtheria toxoid in the control test. These authors, as did Fraser and Halpern,[20] used previously immunized subjects who had a high titer of diphtheria antitoxin before doing the Schick test. Moreover, they did a Schick and a control test with 0.001 cc. of toxoid. While the work of these authors demonstrated that Schick toxin and 0.001 cc. of toxoid can act as a secondary "trigger" stimulus, a fact previously described by Copeman, O'Brien, Eagleton and Glenny [22] and by Parish and Okell,[23] it is effective only in previously immunized persons who again have become "Schick positive" or in immune persons with appreciable amounts of antitoxin. The reaction cannot ordinarily be changed so rapidly by the cutaneous test dose of toxin as to account

18. Karasawa, M., and Schick, B.: Ueber den Gehalt des Serums diphtherie- und masernkranker Kinder an Schutzkörper gegen Diphtherietoxin, Jahrb. f. Kinderh. **72**:460 (Oct.) 1910.

19. Andrewes, F. W.; Bullock, W.; Douglas, S. R.; Dreyer, G., and Gardner, A. D.: Diphtheria: Its Bacteriology, Pathology and Immunology, Medical Research Council, London, His Majesty's Stationery Office, 1923.

20. Fraser, D. T., and Halpern, K. C.: Serial Titrations of Diphtheria Antitoxin Following Toxoid, Canad. Pub. Health J. **26**:476 (Oct.) 1935.

21. Jones, F. G., and Moss, J. M.: The Antitoxin Titers of Human Subjects Following Immunization with Combined Diphtheria and Tetanus Toxoids, Alum Precipitated, J. Immunol. **33**:173 (Sept.) 1937.

22. Copeman, S. M.; O'Brien, R. A.; Eagleton, A. J., and Glenny, A. T.: Experiences with the Schick Test and Active Immunisation Against Diphtheria, Brit. J. Exper. Path. **3**:42 (Feb.) 1922.

23. Parish, H. J., and Okell, C. C.: The Permanence of the Schick Negative State, Lancet **2**:322 (Aug. 18) 1928.

for the negative Schick reaction which we obtained on retests made within a few days of the initial bullous reaction.

We were fortunate in observing 2 children with bullous reactions who were previously admitted to the Mount Sinai Hospital for a non-infectious disease; 1 of them showed a slightly positive reaction and the other showed a negative reaction. When 1 of the children (case 4) had pneumonia four months later, the Schick reaction was bullous. The other child had been in the hospital twice previously for the treatment of cretinism. She had had a positive Schick reaction on her first admission at the age of 1½ years. At the age of 3 years, when she was admitted a second time, the Schick reaction was negative. On her third admission, at the age of 4 years, there was a bullous reaction. She had a temperature of 102 F., probably due to bronchopneumonia. The child was retested seven days after the temperature had dropped to normal. The reaction was entirely negative. A third child (case 5) had a negative reaction following immunization at the Willard Parker Hospital. Four months later, when the child was admitted to the Mount Sinai Hospital with a temperature of 105 F. due to bronchitis and signs suggesting pneumonia, a bullous Schick reaction was obtained, and on retest one week later the reaction was positive but not bullous.

Apparently, then, children who have had a negative Schick reaction may produce a bullous response when they are tested during the acute phase of an infectious disease. Retests after the infection subsides may result in a positive or in a negative Schick reaction. Further retests of some of the children who at first had bullous reactions produced negative reactions after an acute illness and positive reactions again after six months. Our observations are somewhat at variance with those retests reported by Eddy and Mitchell.[24] These authors found the reactions to Schick tests performed during scarlet fever and measles no different from the reactions to tests performed during convalescence from these diseases. They were, however, retesting children who had the ordinary positive Schick reaction and not the bullous type of reaction. Sorgo [25] showed that tuberculous patients were more highly susceptible to intradermally injected toxins, such as Bacterium dysenteriae, than normal patients. His observation demonstrated that altered cutaneous reactivity can occur in tuberculosis. Our observations demonstrate that cutaneous reactivity to diphtheria toxin may be altered in patients with some of the acute infectious diseases.

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24. Eddy, B., and Mitchell, A. G.: Studies in Immunity: III. The Effect of Diseases Other Than Diphtheria on the Schick Test, Am. J. Dis. Child. **40:** 985 (Nov.) 1930.

25. Sorgo, J.: Die Toxinempfindlichkeit der Haut des tuberkulösinfizierten Menschen, Deutsche med. Wchnschr. **37:**1015 (June 1) 1911.

Schick [26] originally stated that exceptions were infrequent to the general rule that a negative reaction signifies the presence of at least 0.03 ($\frac{1}{30}$) unit of diphtheria antitoxin in the blood. Later, Schick, von Groer and Kassowitz [27] indicated that smaller amounts of antitoxin, 0.005 ($\frac{1}{200}$) unit, were found in some patients who had negative reactions. Brandon and Fraser [28] also found that a negative reaction occurred when as little as 0.004 ($\frac{1}{250}$) unit of antitoxin was present in the blood serum, and most workers now agree that negative reactions frequently occur when no more than 0.004 ($\frac{1}{250}$) unit is present. Our work shows that a negative reaction may occur following an acute infectious disease when small amounts of antitoxin are present. This occurred in a number of patients when the test was made after a bullous positive Schick reaction had been obtained. It seems probable that temporary cutaneous anergy immediately following the acute infection might account for such negative Schick reactions. However, one cannot rule out the stimulating effect of the cutaneous test dose of toxin on a subsequent Schick test, provided some immunity was present.

We have no absolute explanation for the pathogenesis of the bullous reaction other than the fact that it was almost always associated in our series with an infectious disease. Dudley [2] explained the vesiculated reaction as being due to a natural hypersensitiveness or allergy to diphtheria toxin. He expressed the belief that it was an allergic pseudoreaction, the opposite of which is the anergy to diphtheria toxin, which we have previously mentioned as one explanation for the negative reaction which we obtained some days after a bullous reaction had been elicited. We considered the possible relation of the bullous reaction to the Shwartzman phenomenon [29] but thus far have no experimental proof of this association. The fluid from a few of the bullae was injected intradermally into rabbits, and twenty-four hours later 25 units of Bacillus typhosus toxin was given intravenously. Local necrosis and hemorrhages (Shwartzman phenomenon) did not result. In this connection it should be pointed out that none of the routine Dick tests done on the arms of all children tested at the Willard Parker Hospital exhibited bullous reactions. The Shwartzman phenomenon has not been obtained with any degree of regularity in rabbits when Dick toxin has been used.

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26. Schick, B.: Personal communication to the authors.

27. Schick, B.; von Groer, F., and Kassowitz, K., in Abderhalden, E.: Handbuch der biologischen Arbeitsmethoden, Berlin, Urban & Schwarzenberg, 1924, vol. 13, p. 137.

28. Brandon, K. F., and Fraser, D. T.: Observations on the Interpretation of Schick Tests, J. Immunol. **31**:387 (Nov.) 1936.

29. Shwartzman, G.: Phenomenon of Local Tissue Reactivity and Its Immunological, Pathological and Clinical Significance, New York, Paul B. Hoeber, Inc., 1937.

Freund [30] stated that he obtained the Shwartzman phenomenon with diphtheria toxin as a cutaneous preparatory dose, intravenous injections of Bact. typhosum toxin having been given twenty-four hours later.

We have demonstrated that small amounts of diphtheria antitoxin are present in the blood of most patients who react with bullae. It is possible that in some patients the toxic substances which are produced in certain acute infectious diseases may interfere with or alter the reaction of diphtheria antitoxin with the cutaneous test dose of diphtheria toxin and thus permit an altered response which results in a bleb. The other possibility is that although we could not demonstrate cutaneous preparatory factors for eliciting the Shwartzman phenomenon in the fluid from the blebs, we may be dealing nevertheless with a phenomenon similar to that described by Shwartzman, since the bullous reaction was elicited only when another toxic agent was present in the body.

CONCLUSIONS

1. Bullous Schick reactions may occur during the acute stage of poliomyelitis, pertussis, pneumonia, measles, scarlet fever, meningococcic meningitis and erysipelas. Such reactions thus far have not been observed by us in normal, healthy children.

2. These bullous Schick reactions may or may not be true positive Schick reactions. The examination of the blood serum of such reactors usually shows the presence of a small amount of antitoxin, sometimes sufficient to indicate an immunity.

3. The interpretation of a negative reaction which follows an earlier bullous positive reaction is uncertain, for this negative reaction may occur when very small amounts of circulating diphtheria antitoxin are present.

4. In only 4 patients could the bullous Schick reaction be elicited a second time. Three of the patients had persistent infections.

5. Children tested during the febrile period of an acute infectious disease in whom bullous Schick reactions develop should be retested some time after recovery before being considered susceptible to diphtheria.

6. There is some possibility of interpreting the observations in the light of the Shwartzman phenomenon.

73 East Ninetieth Street

1155 Park Avenue

Foot of East Fifteenth Street

30. Freund, J.: Hemorrhages in Skin Lesions of Guinea Pigs Following Intravascular Injections of Injurious Substances (Shwartzman Phenomenon), J. Exper. Med. **60**:661 (Dec.) 1934.

REASONS FOR THE HIGH CARBOHYDRATE REQUIREMENT OF INFANTS AND CHILDREN

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The purpose of this paper is to discuss briefly a few of the less well known causes of the fact that the requirement for carbohydrates in the diet of infants and children is higher than that in the diet of older persons.

The normal diet of the breast-fed infant 3 months of age contains, in percentage of the total calories per kilogram of body weight per day, about four times more carbohydrate than the normal diet of a 6 year old child and ten times more than the diet of an adult (table 1). It is clear that here is a problem that is as important and interesting to the biologist as to the pediatrician. It is a daily experience of the latter to observe that the addition of 20 to 25 Gm. of sugar to the diet of an infant produces within twenty-four hours a gain in weight of possibly 100 Gm. or more, or that withdrawal of carbohydrates from the diet of an infant leads within a few days to undesirable loss in weight while the withdrawal of carbohydrates from the diet of older children may produce within twenty-four hours a state of definite ketosis.

These observations have already been the subject of studies [1] which have revealed pronounced differences in the metabolism of carbohydrates in infants, children and adults. The blood sugar level, for instance, is less fixed in infants and children than in adults.[1a] Hypoglycemia develops within from twenty-four to forty-eight hours in infants and young children fed diets free from carbohydrates, and the content of sugar per hundred cubic centimeters of blood has been observed to be between 40 and 60 mg., a level never observed under similar conditions in adults. On the other hand, it must be emphasized that the disposition to ketosis differs greatly in infants and children.[1b] Ketosis can hardly be induced by the administration of a ketogenic diet in infants up to the age of 7 or 8 months, whereas in healthy children on the same diet, within the ages of 4 to 12 years, ketonuria is observed and may be as

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1. (*a*) Heymann, W., and Howe, I.: Untersuchungen über die Besonderheiten des Kohlehydratstoffwechsels im Säuglings- und Kindesalter. I. Ueber stoffwechselchemische Folgen des Kohlehydratenzuges bei Säuglingen und Kindern, Ztschr. f. Kinderh. **53**:629, 1932. (*b*) Heymann, W.: Metabolism Studies on Age Disposition to Ketosis in Human Beings, J. Pediat. **12**:21 (Jan.) 1938.

severe as that seen only in diabetic adults. That ketosis develops much less readily in early infancy than at any other age has been confirmed by Gray.[2] The state of severe acidosis which is regularly observed in infants suffering from alimentary intoxication must be explained, consequently, by the accumulation of acids other than betaoxybutyric and acetoacetic. There is no doubt, accordingly, that carbohydrate metabolism in infants, in children and in adults has definite characteristics that are specific for each age group.

TABLE 1.—*Protein, Fat and Carbohydrate Contents of the Normal Diet of Infants, Children and Adults*

	Weight, Kg.	Energy Quotient, Cal./ Kg./Day	Content of Diet		
			Protein	Fat	Carbohydrate
Infant, 3 months of age (breast fed).....	5	100			
Grams per day.....			9.4	26.2	56.3
Grams per kilogram of body weight per day			1.85	5.25	11 2
Calories per day (total 499).....			37.6	236.0	225.0
Percentage of total calories per day.....			7.5	47.4	45.1
Percentage of total calories per kilogram of body weight per day.....			1.5	9.4	9.0
Child, 6 years of age.....	20	70			
Grams per day.....			53.0	54.0	175.0
Grams per kilogram of body weight per day			2.64	2.7	8.8
Calories per day (total 1,398).....			212.0	486.0	700.0
Percentage of total calories per day.....			15.0	34.7	50.0
Percentage of total calories per kilogram of body weight per day.....			0.75	1.74	2.5
Adult, 30 years of age.....	60	45			
Grams per day.....			67.5	114.0	352.0
Grams per kilogram of body weight per day			1.12	1.9	5.9
Calories per day (total 2,704).....			270.0	1,026.0	1,408.0
Percentage of total calories per day.....			10.0	38.0	52.0
Percentage of total calories per kilogram of body weight per day.....			0.16	0.63	0.9

To throw some light on these problems, the glycogen content of liver and muscle tissues was determined [3] for normal and for fasting rats 8 to 11 days old, 10 to 12 weeks old and 2 to 3 years old. It was observed that the livers of nursing rats contain much less glycogen than the livers of older animals, namely, about 2 Gm. of glycogen per hundred grams of fresh tissue. This amount increases within the first six weeks of postnatal life and then slowly decreases in the adult rat; at the age of 6 weeks the average amount is 5.5 Gm. This observation agrees with data

2. Gray, C. H.: Ketonaemia in Infancy, Lancet **2**:1017 (Oct. 30) 1937.

3. Heymann, W., and Modic, J. L.: Effect of Age and Fasting on Glycogen Content of Liver and Muscle of Rats and Puppies, J. Biol. Chem. **131**:297 (Nov.) 1939.

obtainable in a recent publication of Seckel and Kato.[4] The content of glycogen in muscle tissues of rats does not show a corresponding difference with regard to age.[3]

These results seemed significant enough to warrant experiments on other animal species. Table 2 presents data obtained from similar determinations of the glycogen content in the liver and muscle tissues of rabbits, guinea pigs and dogs. The livers of the young rabbits and of the puppies contained one-half to one-fourth the amount of glycogen found in the livers of the full-grown rabbits and dogs, whereas the muscle tissues of these animals did not show any difference in content of glycogen due to age. That the same diminution in the glycogen content was not found in the livers of young guinea pigs might have to do with

TABLE 2.—*Content of Glycogen in Liver and Muscle Tissues of Young and Full Grown Rabbits, Guinea Pigs and Dogs*

	Glycogen Content (Gm.) per 100 Gm. of Fresh Liver						Glycogen Content (Gm.) per 100 Gm. of Fresh Muscle					
	Rabbits		Guinea Pigs		Dogs		Rabbits		Guinea Pigs		Dogs	
	8 Days Old	Adult	4-6 Days Old	Adult	6 Days Old	Adult	8 Days Old	Adult	6 Days Old	Adult	6 Days Old	Adult
	3.0	10.8	1.8	3.22	1.9	5.6	0.62	1.11	0.74	0.63	0.52	0.90
	2.25	9.8	5.7	2.9	0.67	2.8	0.57	0.81	0.99	0.49	0.87	0.98
	3.65	0.88	2.9	4.3	0.39	4.3	0.55	0.81	0.71	0.72	0.66	0.44
	3.62	2.6	4.4	4.4	0.88	5.3	0.69	0.31	....	....	0.86	....
	....	7.34	3.8	....	1.9	....	....	....	....	....	1.0	....
	....	11.2	3.78	....	....	....	....	....	....	....	....	....
	....	13.4	3.72	....	....	....	....	....	....	....	....	....
	....	2.22	....	....	....	....	....	....	....	....	....	....
Average:	3.13	7.28	3.73	3.70	1.14	4.5	0.61	0.76	0.81	0.61	0.78	0.77

the different development of these animals at birth: Guinea pigs are born with their eyes open, and they do not nurse exclusively but participate immediately in the diet of their parents.

Glycogen values for human tissues must always be regarded with skepticism. The glycogen content of the liver changes rather rapidly after death; starvation or infusions given shortly before death contribute additional sources of error. The work of Burghard,[5] however, leaves little doubt that the liver of the human newborn infant normally contains

4. Seckel, H. P. G., and Kato, K.: Development of the Diurnal Cycle of Liver Function in Nursing Rats: A Chemical and Histologic Study of the Content of Glycogen and of Bile Acids in the Liver Cell, Arch. Path. **25**:347 (March) 1938.

5. Burghard, E.: Der Glykogengehalt der Leber bei tödlichen Erkrankungen im Kindesalter, Monatschr. f. Kinderh. **37**:492, 1927. Burghard, E., and Paffrath, H.: Untersuchungen über den Glykogengehalt der Leber: I. Kritische Untersuchungen über die Methodik der Glykogen- und Kohlehydratbestimmung der Leber, Ztschr. f. Kinderh. **45**:68, 1927.

2 or 3 Gm. of glycogen per hundred grams of liver, whereas that author's values for healthy children and adults are between 6 and 8 Gm. In considering the carbohydrate metabolism of the human infant, one is consequently justified in adding to the age-conditioned characteristics already mentioned one more such characteristic, that is, the physiologically low content of glycogen in the liver.

Why this should be the case is a question that naturally arises, as it is known that the presence of carbohydrates in the diet is of more vital importance in infancy than in any other period.

One possible explanation is that the high rate of glycolysis in liver and kidney tissues [6] of baby rats and human infants may account for the low level of glycogen deposition in the liver, because of the high consumption of carbohydrate in the former process. If this were the case, the same lowered glycogen level would be found in the kidneys of puppies and newborn rabbits that is observed in the livers of these young animals. Glycogen content in the cortex and in the medulla of the kidney had to be determined separately, however, for, as György and Keller [6] observed, the tissue respiration and anaerobic fermentation are distinctly different in these two tissues. Results of determinations showed no difference in glycogen content either in the renal cortex or in the renal medulla between the young and the adult animals. It consequently may be concluded that the higher rate of glycolysis observed also in the liver tissues of young animals [6] does not explain the diminished storage of glycogen in the liver.

It is likely that hormonal causes will be found responsible for these age-conditioned differences in the carbohydrate metabolism of young and adult animals or human beings. It is entirely possible, for example, that the starvation hypoglycemia observed in infants and children is based on immaturity of the pituitary gland, for starvation hypoglycemia can be produced in some animals by hypophysectomy.[7] It may be true also that age disposition to ketosis is conditioned by the presence or absence of the ketogenic principle of the anterior lobe of the pituitary gland.[8] No experimental support can be found in the literature, however, to explain the low level of glycogen storage in the liver of the newborn human and animal infant. Removal of the pituitary gland does not lead,

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6. György, P., and Keller, W.: Neuere zellphysiologische Forschungsergebnisse und ihre Bedeutung für den Wachstumsstoffwechsel des Kindes, Klin. Wchnschr. **10**:365 (Feb. 21); 414 (Feb. 28) 1931.

7. Collip, J. B.: Diabetogenic, Thyrotropic, Adrenotropic and Parathyrotropic Factors of the Pituitary, J. A. M. A. **104**:827 (March 9) 1935.

8. Anselmino, K. J., and Hoffmann, F.: Nachweis, Darstellung und Eigenschaften des Hormons, Klin. Wchnschr. **10**:2380 (Dec. 26) 1931. Hoffmann, F., and Anselmino, K. J.: Stoffwechselwirkungen und -Regulationen des Hormons, ibid. **10**:2383 (Dec. 26) 1931.

with certainty, to diminution of glycogen reserves in the liver of well fed animals.[9]

In general, then, one may say that the reasons for the high carbohydrate requirement which were deduced from this investigation are different in the case of infants from those in the case of children. Some of the causes of the high carbohydrate requirement of infants are the following:

1. The fact that the blood sugar level is not yet fixed, with the result that hypoglycemia is easily produced by starvation.

2. The presence normally of low glycogen reserves in the liver.

3. The rather specific influence of carbohydrates on water retention, which, however, does not seem to have a simple numeric relation to storage of glycogen in the liver.[3]

TABLE 3.—*Glycogen Content in the Cortex and Medulla of Kidneys of Newborn and Adult Dogs and Rabbits*

	5-8 Day Old Puppies		Adult Dogs		5-7 Day Old Rabbits		Adult Rabbits	
	Cortex, Gm. per 100 Gm.	Medulla, Gm. per 100 Gm.	Cortex, Gm. per 100 Gm.	Medulla, Gm. per 100 Gm.	Cortex, Gm. per 100 Gm.	Medulla, Gm. per 100 Gm.	Cortex, Gm. per 100 Gm.	Medulla, Gm. per 100 Gm.
	0.082	0.190	0.168	0.113	0.077	0.064	0.118	0.088
	0.231	0.164	0.162	0.099	0.024	0.224	0.144	0.087
	0.317	0.157	0.178	0.085	0.058	0.819	0.122	0.167
	0.248	0.212	0.156	0.137	0.051	0.760	0.128	.....
	0.102	0.291	0.182	0.115	0.316	.....	0.184	.....
	0.173	0.286	0.175	.....	0.375	.....	0.160	.....
	0.181	0.160	.....	.....	0.257	.....	.....	.....
	.....	.....	.....	.....	0.296	.....	.....	.....
Average:	0.191	0.209	0.170	0.110	0.182	0.467	0.143	0.114

Two reasons for the high carbohydrate requirement of children deducible from these studies are:

1. The persistence of starvation hypoglycemia up to prepuberty.

2. The pronounced tendency to ketosis.

SUMMARY

The livers of 6 to 8 day old rats, rabbits and dogs contain physiologically one-half to one-quarter the amount of glycogen stored under normal conditions in the livers of older animals.

It is unlikely that the high rate of glycolysis in liver tissues of baby rats and human infants causes the low storage of glycogen in the liver, because neither the cortex nor the medulla of the kidney shows a similar diminution in glycogen content, in spite of a similarly high rate of glycolysis in kidney tissue.

9. Russell, J. A.: The Relation of the Anterior Pituitary to Carbohydrate Metabolism, Physiol. Rev. **18**:1 (Jan.) 1938.

Some of the reasons for the high carbohydrate requirement of infants and children deduced from these experiments are:

(*a*) For infants, (1) the fact that hypoglycemia is easily produced by carbohydrate starvation, (2) the presence of low glycogen reserves in the liver and (3) the importance of carbohydrate for water retention.

(*b*) For children, (1) the fact that hypoglycemia is easily produced by carbohydrate starvation and (2) the pronounced tendency to ketosis.

HOSPITAL INFECTIONS

III. A WARD STUDY FOR SOURCES OF INFECTION

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AND

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A survey of the records of the Infants' Hospital of Boston for 1935 and 1936 showed that in 185 of the 1,455 patients admitted during the two year period infections developed in the hospital.[1] The only representative of the common contagious diseases among these infections was pertussis, of which a single case occurred, and there was no hospital infection with enteric organisms. Acute infections of the respiratory tract made up 59.8 per cent of the secondary disorders, while the next largest group was cutaneous infections, which made up 15.6 per cent. It was apparent that 906 patients with acute respiratory disease (including pneumonia) who were admitted during the two year period as well as members of the staff, attendants and visitors with similar conditions presented the great source of danger in the wards.

Jacobi [2] described conditions existing in 1871 in regard to morbidity and mortality in a home for infants and children in New York. There were 2,000 cases of sickness among 377 children admitted in 1870 and over 1,400 cases of sickness among 358 children admitted in 1871. These were house-contracted illnesses, as it was a rule of the institution that the health of the child must be good on admission. The general mortality rate ranged between 25 and 30 per cent, and the mortality for infants under 3 months of age was 66 per cent. Chief among the causes of death were diarrheas, pneumonia, measles, diphtheria, scarlatina, whooping cough and tuberculosis.

In the intervening years the production of clean, safe milk for infant consumption has been rewarded by a lowered incidence of the

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1. McKhann, C. F.; Steeger, A., and Long, A. P.: Hospital Infections: I. A Survey of the Problem, Am. J. Dis. Child. **55**:579 (March) 1938.

2. Jacobi, A.: Inaugural Address, Including a Paper on Infant Asylums, New York M. J. **15**:1, 1872.

diarrheas. The "contagious" diseases have also ceased to be major problems, largely because of improved prophylactic measures and better facilities for isolation. Methods of protecting patients in pediatric wards from infections not classed as contagious, especially infections of the respiratory tract, have developed more slowly.

The Infants' Hospital in Boston, incorporated as the West End Nursery Society in 1881, was forced to close its wards during the summers from 1883 to 1914 because of the high mortality from diarrheal diseases during the hot months. With the decline in enteric disorders, attention was directed toward respiratory diseases. The report of the hospital for 1916[3] discussed the high incidence of infections of the respiratory tract contracted in the hospital and mentioned that a separate cubicle for each infant might prevent such infections. During the years 1914 to 1919 there were reported to have been hospital-acquired infections in 35 per cent of the patients in the wards of the Infants' Hospital.[3] In 1916 a special effort was made to remedy the situation by allowing more space for individual patients, by attempting to separate infected from noninfected patients and by using aseptic "bed isolation" technic in known sources of infection. The infection rate was reduced to 15 per cent during the next eighteen months.

Individual cubicles for each patient were finally adopted by the Infants' Hospital in 1923. Each cubicle was 6 feet (183 cm.) wide, and the partitions extended 6 feet and 6 inches (198 cm.) upward. Individual gown technic was instituted, and the hands were scrubbed before any baby was cared for or examined. This technic was considered by 1926 to have reduced the incidence of hospital infections to a minimum. Since that time there have been installed separate rooms to furnish a more suitable environment for the care of premature infants. An air-conditioning system under automatic control[4] maintains the temperature, humidity and ventilation of the nursery, and only those nurses and doctors as the proper care of the infants absolutely requires are allowed admission to the premature infants' nursery.

Nevertheless, as noted in the survey of the records, there still occurred a sizable number of hospital infections, mostly of the respiratory tract. The studies of Wells and his associates[5] on the subject of air-

3. Infants' Hospital: Annual Reports 34, 35, 36, 37, 38, 41 and 44.

4. Blackfan, K. D., and Yaglou, C. P.: The Premature Infant: A Study of the Effects of Atmospheric Conditions on Growth and on Development, Am. J. Dis. Child. **46**:1175 (Nov.) 1933.

5. Wells, W. F.: Apparatus for Study of Bacterial Behavior of Air, Am. J. Pub. Health **23**:58, 1933. Wells, W. F., and Stone, W. R.: On Air-Borne Infection: Viability of Droplet Nuclei Infection, Am. J. Hyg. **20**:619, 1934. Wells, W. F., and Brown, H. W.: Recovery of Influenza Virus Suspended in Air and

(Footnote continued on next page)

borne infection indicated the necessity of reappraisal of the problem in the light of these observations. By the development of an ingenious method for the bacteriologic analysis of air, Wells and his co-workers have been able to demonstrate quantitatively the bacterial content of the air. They have shown that droplets expelled from the nose and throat undergo evaporation to become minute particles or droplet nuclei, which may remain in the air for long periods and drift about with air currents. Samples of air were taken from well baby clinics, children's medical clinics, hospital wards, school rooms, factories and theaters.

Sterilization of air by means of ultraviolet irradiation has been investigated independently by Wells and his co-workers [5] and by Hart [6] in an effort to combat the dangers of air-borne organisms. Hart has dealt chiefly with the problem of contamination of the air in the operating room.

Sterilization of air by ultraviolet irradiation as a means of control ling the spread of infection in hospital wards has been under trial in the isolation unit of the Children's Hospital in Boston for the last three years. The data obtained still do not permit of evaluation of the efficacy of this procedure. It became apparent that two different modes of transmission of infection of the respiratory tract are probably operative in any hospital ward: (1) transmission of organisms coughed, sneezed or otherwise expelled by the patient and carried by air currents to another patient at some distance, a mode of transmission which might well be interrupted by ultraviolet irradiation; (2) transmission by direct transfer of organisms from the personnel by the fingers or by droplets expelled from the nose or throat, a mode of transmission which sterilization of the air in the ward by ultraviolet rays could hardly influence to any extent.

NATURE OF PRESENT STUDY

Before undertaking a controlled study in the Infants' Hospital of the efficacy of ultraviolet rays in the prevention of air-borne infection and of masks in conjunction with gown technic in the prevention of per-

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Its Destruction by Ultra-Violet Radiation, ibid. **24**:407, 1936. Wells, W. F., and Fair, G. M.: Viability of B. Coli Exposed to Ultra-Violet Radiation in Air, Science **82**:280, 1935. Wells, W. F., and Wells, M. W.: Air-Borne Infection, J. A. M. A. **107**:1698 (Nov. 21) 1936; Air-Borne Infection: Sanitary Control, ibid. **107**:1805 (Nov. 28) 1936.

6. Hart, D.: Sterilization of Air in Operating Room by Special Bactericidal Radiant Energy: Results of Its Use in Extrapleural Thoracoplasties, J. Thoracic Surg. **6**:45, 1936; Operation Room Infections: Control of Air-Borne Pathogenic Organisms, with Particular Reference to Use of Special Bactericidal Radiant Energy; Preliminary Report, Arch. Surg. **34**:874 (May) 1937. Hart, D., and Gardner, C. E., Jr.: Sterilization of Air in Operative Region with Bactericidal Radiant Energy: Results of Its Use in Two Hundred and Eighteen Operations, Tr. South. S. A. **49**:376, 1937.

sonnel-to-patient infection, it seemed desirable to extend the foreperiod data derived from the survey of the records [1] and to carry on a direct concurrent investigation of the subject. It was hoped that more detailed information than could be derived from the review of the records would be obtained and that the relative frequency of the two mechanisms of the spread of infection might be disclosed.

The present study covered ten consecutive months, divided on the basis of different procedures into three periods, as follows:

1. June 1 to Sept. 30, 1937—Period of clinical observation and investigation only.

2. Oct. 1 to Dec. 31, 1937—Bacteriologic studies added to the clinical investigations.

3. Jan. 1 to April 1, 1938—Period of masking of all hospital personnel and visitors.

A special individual record system was established. All patients were observed daily, and instances of disturbances acquired after admission to the hospital were investigated. Beginning on October 1, cultures of material from the nose and throat were made at the time of the infant's admission to the hospital. Thereafter, when a patient showed any symptoms or signs of a newly acquired infection of the respiratory tract, material from the nose and throat was cultured in like manner. Material from members of the nursing and resident medical staff was likewise cultured from time to time in an effort to trace sources of individual infections. A continuous bacteriologic record of all nursing and medical attendants, students and visiting and consulting physicians was not possible.

The hospital was a two-floored structure with two wards containing twenty glass-partitioned cubicles on each floor. In addition, there were two rooms for premature infants situated on the first floor. The hospital was staffed and equipped to care for 35 patients and maintained an average daily census close to this number. The formula room, where all the infants' formulas and other food was prepared, was on the lower floor, and a special room for the administration of treatments was located on the upper floor.

The staff consisted, during this study, of visiting members, a resident physician and 2 house officers. There were 7 graduate nurses and 4 attendants on permanent duty and 22 student nurses whose term of service was one month. From 4 to 6 medical students were on service at all times. Their length of service was also one month. Teaching rounds were held once a week, attended by 15 to 30 people. Parents of the patients were admitted to the wards on Saturday afternoons only, exceptions being made to the rule in the case of babies in a critical condition, whose parents were allowed to visit at any time.

The number of visitors to the wards was from 35 to 50 per day, exclusive of the nursing personnel and resident medical staff but including visiting staff, medical students and others present at medical and teaching rounds, consultation visitors, visiting outside physicians, parents and all others.

In an attempt to determine the effect, if any, that the masking of all personnel and visitors to the wards might have on the incidence and types of nosocomial infection, all persons were masked during the third period of the study. A discussion of the type of mask used and the methods used in testing their efficiency will be given elsewhere.

HOSPITAL-ACQUIRED INFECTIONS

Sixty infections developed in the hospital among the 585 patients remaining in the wards for periods in excess of twenty-four hours, an attack rate of slightly over 10 per cent. In 6 patients two separate infections developed during their stay in the hospital. Infections of the respiratory tract accounted for the greatest number (over 63 per cent) of the secondary processes. Infections of the skin were next in order but were responsible for only 8 of the 60 total infections.

Twenty-five (42 per cent of the total) infections occurred among infants less than 3 months of age, approximately 1 child in every 7 of this age group becoming infected while in the ward. Fifty-seven per cent of infections were acquired by patients after a stay of two weeks or longer in the wards, while 17 per cent of all patients remaining in the wards for periods exceeding two weeks became secondarily infected, an infection of the respiratory tract developing in 1 in 8 patients.

Patients admitted because of premature birth and those suffering from malnutrition appeared to be highly susceptible to infection, the attack rate being 18 per cent in both categories. Of the specific dietary deficiency diseases, scurvy alone seemed to predispose the patient to infection. One fifth of the patients admitted for this cause became infected while in the ward.

Infants presenting evidence of debilitating processes or chronic infection such as congenital syphilis, congenital deficiencies or eczema, also appeared to be highly susceptible to infection. One third of the eczematous infants became infected while in the hospital.

Infections of the skin, though second in numbers of the total infections acquired, were not of great significance. The few patients with contagious disease admitted to the wards and the 2 patients with Sonne dysentery gave rise to no cross infections.

The findings confirmed strikingly the conclusions indicated by the earlier survey of the records, that infections of the respiratory tract command the most important position among nosocomial infections in infants, and that premature babies and malnourished or debilitated infants appear to be especially susceptible to hospital infections.

CLINICAL AND BACTERIOLOGIC DATA

Tracing the mode of transmission of certain organisms was undertaken in the effort to discover the sources of the hospital-acquired infections. It was appreciated that newly acquired organisms found in the noses and throats of patients suffering from newly contracted infections of the respiratory tract might not in themselves be the causative agent of the infection. Since the cultivation of the viruses of infections of the upper respiratory tract was not on a basis applicable to a problem of this kind, only bacteria that might be either the cause of or the secondary invader in the infection could be sought. Of the common pathogens of the respiratory tract, the pneumococcus lent itself best to study, because of the subclassification into thirty types for which specific diagnostic serums were available.[7] The complexity of the methods[8] available for the study of the streptococcus rendered equally complete epidemiologic investigation of this organism impracticable. Some evidence regarding Streptococcus haemolyticus was gathered through the determination of the dissociation variants of each strain isolated. The dissociation phases of the influenza bacillus strains were also determined.

Conclusions could not be drawn in regard to such organisms as staphylococci and indifferent or gamma streptococci, organisms which were present in a number of hospital-acquired infections. For the most part, these organisms were present at all times in patients in the wards, and also were common among the members of the attending staff.

Bacteriologic Data, Oct. 1 to Dec. 31, 1937.—Evidence of added bacterial infection was found in 12 of the 13 patients in whom infections of the respiratory tract developed during this period. The isolation on reculture of an organism or organisms that could have been the cause of or secondary invader in the infection but had not been demonstrated to be present in the cultures made from the patient on his admission to the hospital was deemed evidence of added bacterial infection. Five of these 12 patients had pneumococcic infections with various higher types of pneumococci not demonstrable in any other patient in the ward prior to or at the time the secondary infection occurred. One had a pneumococcic infection with a type of pneumococcus (XIV) present in the

7. Cooper, G.; Rosenstein, C.; Walter, A., and Peizer, L.: Further Separation of Types Among Pneumococci Hitherto Included in Group IV and Development of Therapeutic Antisera for These Types, J. Exper. Med. **55**:531, 1932.

8. Lancefield, R. C.: Antigenic Complex of Streptococcus Haemolyticus: Demonstration of Type-Specific Substance in Extracts of Streptococcus Haemolyticus, J. Exper. Med. **47**:91, 1928; Serological Differentiation of Human and Other Groups of Hemolytic Streptococci, ibid. **57**:571, 1933. Lancefield, R. C., and Hare, R.: Serological Differentiation of Pathogenic and Non-Pathogenic Strains of Hemolytic Streptococci from Parturient Women, ibid. **61**:335, 1935. Griffith, F.: Serological Classification of Streptococcus Pyogenes, J. Hyg. **34**: 542, 1934.

ward, the apparent causative agent in a case of fatal pneumonia in a nurse. This nurse had been assigned to care for the patient in whom the secondary pneumonia developed and for 1 other patient in whom the organism was subsequently demonstrated but who presented no clinical sign of infection. One infection due to hemolytic streptococcus variant "F" occurred in a child who had been cared for by a nurse who was found to be harboring a hemolytic streptococcus of the same classification in her throat. In another instance there was found in the throat and glands of a premature infant who had been alone in the room for premature infants a hemolytic Staphylococcus aureus. This organism was also isolated from the throat of one of the nurses who attended this patient. In another premature infant in whom an infection of the upper respiratory tract developed, there was found a hemolytic streptococcus variant "C" as a hospital-acquired organism at a time when there were no streptococci demonstrable among the other premature infants. Bacillus pyocyaneus was demonstrated as a hospital-acquired organism in a patient in whom otitis developed in the ward; there had been no infections by this species of organism in the wards prior to that time.

There were but 3 instances in which the organisms demonstrated to be present in newly acquired respiratory flora were also demonstrable in other patients in the wards at the same time. They were gamma streptococci in 2 instances and Staph. aureus in 1.

The flora of 14 patients who presented no evidence of secondary infection were restudied; 9 were found to be harboring organisms not demonstrable on admission. Of these organisms, 2 were pneumococci of types not present among the other patients and 1 was a pneumococcus of a similar type (XIV) to that found in 1 of the clinically infected patients and also in the nurse who had attended both patients. One was a hemolytic streptococcus variant "C." Two were hemolytic staphylococci. One hospital-acquired organism was a nonhemolytic Staph. aureus and 1 a gamma streptococcus, both of which species were relatively common among the flora of the patients in the ward. Pneumococcus type XXIX was isolated from 1 patient presenting no clinical evidence of infection; at the same time there was a pneumococcus of similar type present in another patient on the same floor at the opposite end of the ward. A rough strain of Haemophilus was isolated from a premature baby; there was no other premature infant harboring this organism.

Bacteriologic Data, Jan. 1 to March 31, 1938.—There was evidence of new bacterial invasion in nine of the thirteen infections of the respiratory tract occurring in the wards during this period. Two of these were found to be pneumococcic infections, both due to pneumococcus type XIV, and in both instances there were patients in the wards suffering from type XIV pneumonia; no intermediate carriers could be demonstrated among the immediate personnel. Five patients showed invasion

by staphylococci, of which there were many in the wards, both among patients and among personnel. One patient became infected by a smooth virulent strain of the H. influenzae; no comparable strain was present among the other patients at the time. One patient became infected by hemolytic streptococcus variant "C." Only 1 member of the personnel caring for this patient, a student nurse, was found to be harboring a hemolytic streptococcus variant "C" in her throat.

Of the 14 patients in whose cases reculture was done but who presented no indication of infection, 4 were found to have acquired new organisms. Two of these were hemolytic staphylococci, and 1 was a rough respiratory strain of H. influenzae comparable to others in the ward at the time. One was a pneumococcus type VI; there had been 4 patients in the wards harboring this type of organism during the interval between cultures on this patient.

TABLE 1.—*Comparison of Admissions of Patients with Infectious Disease and of Hospital Infections in Various Periods*

Period	Total Admissions of Patients with Infectious Disease	Admissions of Patients with Infection of the Respiratory Tract	Total Hospital Infections	Hospital Infections of the Respiratory Tract
June	35	26	2	..
July–September	82	64	26	12
October–December	97	77	18	13
January–March	113	96	14	13

COMPARISON OF THE PERIODS OF BACTERIOLOGIC OBSERVATION

The total number of admissions to the hospital in each of the two periods was essentially the same, 195 from October 1 through December and 190 from January 1 through March. Likewise the number of patients remaining in the wards for periods exceeding twenty-four hours was not appreciably different, 167 in the former and 160 in the latter period. However, the number of patients admitted with infections of the respiratory tract was 77 in the former and 96 during the latter three month period (table 1). In addition, the incidence of the occurrence of pathogenic organisms, such as pneumococci, hemolytic streptococci and H. influenzae, as well as the incidence of certain of the nonpathogenic forms among the patients admitted, showed a definite increase during the latter months.[9] Despite the increase in the wards in number of patients with respiratory disease and the increase in pathogenic organisms found in the cultures made on admission, the occurrence of hospital-acquired

9. Long, A. P.; McKhann, C. F., and Cheney, L. L.: Hospital Infections: II. Nasopharyngeal Flora and Disease of the Respiratory Tract in Infants, Am. J. Dis. Child. **57**:1363 (June) 1939.

infections remained essentially the same, a total of 18 infections and 13 infections of the respiratory tract having been acquired in the former period and fourteen total infections and thirteen infections of the respiratory tract having been acquired during the latter period. In the period from October to December, the evidence indicated the probable source of the infections to be hospital personnel rather than fellow patients. In the latter period the results were less clearcut, yet two infections seemed definitely spread by personnel. In the other cases the infecting agents or secondarily invading organisms might be accounted for by the presence of organisms of similar types among the patients in the ward. Thus in the first period there were found 6 patients with hospital-acquired infections in whom newly acquired types of pneumococci were present and 4 patients, on whom reculture was done although they presented no new clinical infections, in whom were demonstrated newly acquired pneumococci. In only 1 instance was a patient-to-patient transfer a possibility. The source of danger seemed predominantly the personnel.

During the second period pneumococci acquired in the hospital were found in only 3 instances, in all of which the same types were present simultaneously in the wards in 1 or more patients.

During this period all hospital personnel and visitors to the wards were masked. It was in an attempt to control the dissemination of organisms from personnel to patient that the regimen of masking was instituted. The type of mask utilized for the purpose of this study was shown by laboratory methods to possess better than 95 per cent efficiency in the prohibition of the passage of organisms in droplets and about 75 per cent in the filtration of droplet nuclei. Because it did not fit in an air-tight manner and because of the inefficacy against nuclei, the mask should protect the patient to a much greater degree than the wearer. Whether these masks are impervious to the passage of ultramicroscopic viruses cannot be stated. Furthermore, it must be recognized that the laboratory efficiency and the clinical efficiency of a mask are not necessarily identical. It was not felt that by the simple procedure of masking an end could be brought to hospital-acquired infections of the respiratory tract, but it was deemed necessary to ascertain if possible the effect of masking in relation to the subsequent determination of the efficacy of ultraviolet rays. Noteworthy is the fact that after the institution of masking no infection occurred in the room for premature infants, where air conditioning and minimal visiting kept air contamination at a minimum.

AIR CONTAMINATION

Sampling of air by the Wells air centrifuge [5] showed that there were numerous bacteria of various kinds in the air of the hospital. Table 2 shows the results of such air samplings in the various wards in the

Infants' Hospital and in the medical wards for older children. Values are also given for similar air samples from the artificially air-conditioned room for premature infants.[10] Both the total number of organisms found to be present and the sharp contrast between the open wards and the room for the premature are of interest. The comparative total colony counts are seen to be in the order of magnitude of 20 in the samples taken in the room for premature infants, to between 600 and 1,000 in those from the other wards. Alpha streptococci are shown to be fairly consistently present in the air of the open wards, while none were demonstrated in the air-conditioned room.[11]

These striking differences may be attributable only in part to the air-conditioning system, as there were only 2 babies occupying the

TABLE 2.—*Bacterial Counts of Air Samples from Various Wards*

Ward	Sample *	Total Count †	Alpha Streptococci
Premature infants' room	1	18	0
	2	24	0
	3	19	0
	4	25	0
	5	15	0
	6	23	0
Infants' ward A	1	953	0
	2	651	2
	3	581	2
Infants' ward B	1	604	1
Infants' ward C	1	813	5
Infants' ward D	1	1,092	1
Children's medical ward A	1	963	0
Children's medical ward B	1	813	2
Children's medical ward C	1	790	0
Children's medical ward D	1	1,278	1

* Each sample consisted of 10 cubic feet (28.3 cubic meters) of air. All samples numbered 1 were taken on one day and all others on a different day.

† The counts given represent the number of colonies present in the collecting tube.

room for premature infants at the time and the adult traffic into this room is always minimal. It is still suggestive that the air-conditioning process, installed with its main objective the production and control of a constant atmospheric condition felt to be the most nearly optimal for these immature infants from a physiologic point of view, may have as an adjunct to this function the continued purification of the air from the standpoint of bacterial contamination. Furthermore, the differences suggest that overcrowding may be of the greatest consequence in connection with hospital-acquired infections, when the term over-

10. Mr. W. F. Wells, of the department of bacteriology of the University of Pennsylvania, was responsible for these determinations.

11. These determinations were made at a time when there was routine masking throughout the Infants' Hospital but not in the medical wards for older children.

crowding refers not only to the placing of patients in too close proximity to each other but to the large number of persons other than patients who are permitted to be present in the wards at various times.

The data and evidence here set forth have been collected to serve as a foundation and a control for further observations now being made on the efficacy of masking of personnel and on the influence of ultraviolet irradiation of air in the prevention of hospital infections.

SUMMARY

A direct, concurrent study of hospital infections in an infants' hospital confirmed the findings derived from an earlier survey of the records of the same institution.

Infections of the respiratory tract accounted for 63 per cent of the hospital infections which were acquired by over 10 per cent of the patients admitted. Most of the secondary infections occurred in very young, premature, malnourished or debilitated infants who had been in the hospital for several weeks.

Acute infections of the respiratory tract, including pneumonia, present among the patients on admission as well as similar infections and carrier states among the staff, attendants, and visitors, were the great source of danger.

Examinations for new nasopharyngeal bacterial invaders in secondarily infected patients indicated the source of most of the infections to be hospital personnel and visitors rather than fellow patients.

Overcrowding in connection with hospital-acquired infections should be considered, with the term overcrowding applied not only to patients but to the large numbers of persons other than patients who are permitted to enter the wards.

Some diminution in the transmission of organisms followed masking of all persons entering the ward. Masking, even with a special type of mask, was insufficient to eliminate secondary infections.

VALUE OF BANANA AND BANANA POWDER IN THE TREATMENT OF INFANTS AND CHILDREN HAVING DIARRHEA

A TWO YEAR CLINICAL STUDY

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The present paper describes a two year investigation of the use of banana powder in the treatment of hospitalized infants and children having diarrhea. The results are compared with those obtained in the study of a similar group of control patients treated with more usual methods.

Mashed banana and powdered banana are growing in popularity as foods for infants. Since the initial observation of Haas [1] that "carbohydrate in the form of ripe bananas appears to be tolerated perfectly" by patients with celiac disease, a number of papers have appeared concerning the suitability of this fruit as a carbohydrate supplement, not only in the treatment of celiac disease but for the feeding of normal infants [2] and in high caloric diets for malnourished infants.[3] The first writer to recommend its use in the treatment of the acute digestive disorders appears to have been Fanconi.[4] The literature dealing with

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From the Department of Pediatrics of the School of Medicine, University of Pennsylvania.

1. Haas, S. V.: The Value of the Banana in the Treatment of Celiac Disease, Am. J. Dis. Child. **28**:421 (Oct.) 1924.

2. von Meysenburg, L.: The Banana as a Food for Infants and Children, New Orleans M. & S. J. **80**:180 (Sept.) 1927. Johnston, J. A.: Place of the Banana in the Diet of Children, J. Am. Dietet. A. **3**:93 (Sept.) 1927. Siperstein, D. M.: New Trend in the Diet of Infants, Journal-Lancet **51**:287 (May 1) 1931. Friedman, S.: Infant Feeding and Nutrition: A Decade of Progress, Am. J. Dis. Child. **49**: 153 (Jan.) 1935. Pearce, N. O.: The Use of Banana Sugar as the Carbohydrate in Milk Mixtures for Well Babies, Arch. Pediat. **52**:292 (May) 1935. Craig, J. D.: Ripe Banana as a Complementary Feeding in Infants, J. Pediat. **13**:239 (Aug.) 1938.

3. Thursfield, H.: The Use of Banana Pulp in the Feeding of Marasmic Infants, Arch. Dis. Childhood **2**:49 (Feb.) 1927.

4. Fanconi, G.: Die Obstdiät bei akuten Verdauungstörungen des Kindes. Acta pædiat. **11**:380, 1930.

this aspect is not extensive, but the reports indicate that the use of banana is a safe and helpful procedure in the therapy of diarrhea.[5]

As is well known, banana is almost completely free from both fat and protein. Its caloric value is largely due to monosaccharides and disaccharides. Together these make up 20 per cent of the edible portion. There is little apparent difference between fresh banana and the banana powder except in the physical state and the water content.

The virtues of the banana diet in the treatment of gastrointestinal disorders have been variously ascribed to the mechanical effect, or peculiar toxin-absorbing property, of the pectin,[6] as well as to the inhibition of growth of pathogenic organisms and to the fostering of growth of nonpathogenic fermentative bacteria within the alimentary canal.[7] The evidence on these points is not conclusive.

METHOD

Subjects.—All children who were admitted because of diarrhea to the Children's Hospital of Philadelphia, St. Christopher's Hospital for Children and the pediatric ward of the Hospital of the University of Pennsylvania between Nov. 1, 1936 and Oct. 31, 1938 were included in this study. It was felt that patients sufficiently ill to require hospitalization were more suitable material for the evaluation of dietary therapy than a group treated in the outpatient departments. However, in order adequately to compare the efficacy of the two types of therapy under consideration, the data on the following classes of patients were omitted from consideration:

1. Patients whose diarrhea ceased in less than twenty-four hours after admission.

2. Patients in an extremely toxic condition who died within forty-eight hours after admission.

3. Patients in whom diarrhea was a minor subsidiary symptom of systemic disease (e. g., atresia of the bile ducts).

4. Patients who had been breast fed during hospitalization.

5. Patients who had starvation diarrhea.

6. Patients who were removed from the hospital within forty-eight hours after institution of treatment.

The patients with diarrhea were separated entirely at random into (1) a control series and (2) a comparable number who were fed banana or banana powder.

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5. Joslin, C. L.: Banana Therapy in Diarrheal Diseases in Infants and Children, South. M. J. **29**:1007 (Oct.) 1936. Brubaker, E. W.: The Treatment of Acute Diarrheal Disorders of Infancy and Early Childhood with Banana and Banana Powder, J. Michigan M. Soc. **36**:40 (Jan.) 1937. Joslin, C. L.; Bradley, J. E., and Christensen, T. A.: Banana Therapy in the Diarrheal Diseases of Infants and Children, J. Pediat. **12**:66 (Jan.) 1938. Socola, E. A.: The Value of Banana Therapy in Diarrheal Diseases of Infants and Children, New Orleans M. & S. J. **91**:192 (Oct.) 1938.

6. Mitchell, A. G.: The Therapy of Diarrhea in Children, J. A. M. A. **112**: 141 (Jan. 14) 1939.

7. Baumann, T., and Forschner-Böke, H.: Untersuchungen zur therapeutischen Wirkungsweise von Apfel- und Bananendiät, Ztschr. f. Kinderh. **56**:514, 1934.

The groups consisted of ward patients with 1 private patient added; their ages ranged from 1 week to 10 years, the majority being below the age of 2 years (table 1). The two groups of patients were approximately equal in size and were under treatment simultaneously. They were under the direct care of attending pediatricians and house officers in the three hospitals. The children came from the underprivileged groups in Philadelphia, and many were Negroes. The great majority were seen during the months of July through October in each year.

Criteria.—For this survey the term diarrhea was defined as the passage of loose, watery, mucopurulent or bloody stools, usually with an increase in frequency. In accordance with this definition, therefore, patients suffering from known enteric infections, such as typhoid or paratyphoid fever, but having stools normal in number and appearance were not included.

The attacks of diarrhea were evaluated as being moderate, severe or very severe. This appraisal, wholly clinical, was based on the duration of symptoms before and after treatment, the presence or absence of dehydration, acidosis or intoxication and the number and appearance of the stools.

The patients were classified also, according to the nature of the diarrhea, as (1) specific, (2) parenteral and (3) unknown. The "specific" group contained both those patients in whose blood a causative bacterium was isolated and those on whom a significant seroagglutination was obtained; included also were a few patients with normal findings from families in which other members were simultaneously and similarly affected by known organisms. The "parenteral" group comprised those patients in whom the diarrhea seemed clearly secondary to, and produced by, an accompanying infection in some portion of the body other than the gastrointestinal tract. In the "unknown" group were placed all remaining patients, including many who seemed clinically to have a specific enteral infection but on whom positive laboratory data could not be obtained.

Infections of the respiratory tract were common among members of all three groups. In nearly every instance of parenteral diarrhea the diarrhea was secondary to such involvement.

Recovery was judged as poor or good. The outcome was as a rule considered good if complete recovery had taken place by the end of a week, although some consideration was given to the severity of the attack and to its duration before institution of treatment. An abundance of chemical laboratory data was gathered, but in view of the great individual variations among the patients and the different methods of treatment favored by attending physicians, it was felt that the clinical judgments concurred in by both of us offered a more satisfactory basis for evaluation than did specific numerical criteria such as the average number of days of illness or the total number of stools passed between institution of treatment and recovery.

In treating a few of the patients, after several days' trial had failed to produce any clinical improvement the attending physicians changed the feeding routine from one regimen to the other. Such patients were judged as having shown a poor result for the first kind of therapy instituted, although in most instances no sudden improvement followed the change. The occasional relapses were usually attributed to too rapid return to normal diets; patients who had relapses were classified as having poor results.

No restrictions were placed on the use of adjuncts to dietary therapy in the treatment of either group. Parenteral fluids and blood transfusions were administered whenever indicated; in some instances continuous venoclyses were needed. Soluble phenobarbital (U. S. P. phenobarbital sodium) was the drug most generally used for restlessness. Camphorated tincture of opium and bismuth subcarbonate were prescribed but rarely. Free use of drugs was permitted, but they

were given to surprisingly few patients; this illustrates the modern tendency to rely on dietary measures and parenteral injections rather than on drugs in the treatment of the diarrheal diseases.

Regimens.—Control Series: Complete freedom of choice of therapy was permitted for the control group only. For these the following therapeutic procedure was employed: An initial starvation period was established, during which a mixture of orange juice, physiologic solution of sodium chloride and 10 per cent dextrose solution was given freely; after one to two days this feeding was changed to any one of a wide range of special formulas, such as protein milk, skimmed milk, lactic acid skimmed milk, barley and rice gruel, scraped or powdered apple or a milk-free diet.

Experimental Series: To the experimental group the diet was administered according to the following general outline, which was adjusted as needed. As a rule, the infants below the age of 6 months were fed banana powder [8] in watery solution, whereas the older patients received ripe bananas freshly mashed. Sodium chloride frequently was added in small unmeasured amounts. No differences were detected in the effects of fresh ripe banana as compared with those of banana in the preserved powdered form. This banana regimen differs from the more usual diarrheal feeding routine mainly in that from the time when the therapy is instituted the patient receives large quantities of a residue-producing food rich in carbohydrate, instead of undergoing a period of partial starvation at the beginning of treatment.

I. First forty-eight hours

1. Mashed ripe banana (yellow skin flecked with brown): one third of a banana (1⅙ ounces; 33 Gm.) per pound (543 Gm.) of body weight per twenty-four hours, or
2. Banana powder: 1 tablespoon (⅓ ounce; 9.5 Gm.) per pound of body weight per twenty-four hours as a paste or as a 7.5 per cent solution in water or in half strength physiologic solution of sodium chloride.

These were offered every two hours during the twelve hours of the day and every four hours during the night (at 10 p. m. and 2 a. m.). The amounts given at the two night feedings were twice the size of those given at the day feedings.

II. Second forty-eight hours

A. For infants under 2 years of age:

1. Well boiled (five minutes) skimmed milk: 1½ ounces (44.36 Gm.) per pound of body weight per twenty-four hours, with powdered banana added up to 7.5 per cent of the formula. Equal feedings were spaced at regular hours.
2. Boiled water liberally between feedings.

B. For older children (transitional diarrhea diet):

1. Breakfast—cereal cooked with water or skimmed milk, toast, cottage cheese, very little sugar, boiled skimmed milk and water.
2. Dinner—potato, rice or barley gruels sweetened with saccharine, toast, soda crackers and water.
3. Supper—cereal cooked with water or skimmed milk, toast, banana, boiled skimmed milk and water

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8. The powder used in this study was that known formerly as Melotose No. 1 and now as Banana Powder, manufactureed by the United Fruit Company and distributed by Food Concentrates, Inc., New York.

After ninety-six hours the full regular diet was begun. If the diarrhea recurred the banana regimen was reinstituted.

RESULTS

Table 1 indicates that in the majority of patients the diarrhea occurred within the first twelve months of life. Of a total of 80 patients in the control group, 49 (61 per cent) were under the age of 1 year. In the group fed the banana diet, 54 (56 per cent) of the total of 97 patients were under that age. The second year showed somewhat greater incidence than did the years between the second and the thirteenth, but the frequency was considerably less than during the first

TABLE 1.—*Age Distribution of Subjects Classified According to Types of Diarrhea*

Age	Control Group				Banana Diet Group			
	Specific	Parenteral	Unknown	Total	Specific	Parenteral	Unknown	Total
Birth to 3 mo.	3	6	11	20	7	4	12	23
4- 6 mo.	4	7	5	16	3	4	5	12
7- 9 mo.	3	4	..	7	..	6	9	15
10-12 mo.	2	1	3	6	1	1	2	4
13-15 mo.	2	1	..	3	3	..	2	5
16-18 mo.	..	1	1	2	..	2	..	2
19-21 mo.	1	..	1	2	3	..	1	4
22-24 mo.	..	..	1	1	..	..	1	1
2- 3 yr.	1	..	1	2	4	1	3	8
3- 4 yr.	..	1	1	2	8	..	1	9
4- 5 yr.	7	..	2	9	2	1	4	7
5- 6 yr.	..	..	1	1	..	..	2	2
6- 7 yr.	1	..	..	1	..	..	..	..
7- 8 yr.	6	..	..	6	2	..	1	3
8- 9 yr.	..	1	..	1	..	..	..	..
9-10 yr.	..	..	..	..	1	..	..	1
Over 10 yr.	1	..	..	1	1	..	..	1
Total	31	22	27	80	35	19	43	97

year. With but a few exceptions, all patients whose conditions were diagnosed as parenteral diarrhea were less than 19 months of age.

The various pathogenic organisms and specific agglutinations encountered during the two years covered by this study are listed in table 2. This list demonstrates the ubiquity of a wide variety of diarrhea-producing bacteria among the children of Philadelphia. The positive bacteriologic findings were reported by only two of the three cooperating hospitals. As stated earlier, there were a number of patients who had conditions which appeared to be due to infections of the gastrointestinal tract but who were placed in the "unknown" group because of the absence of definite proof of such origin.

In the tabulating of the data it was found that the distribution of patients in terms of severity of disease was practically identical for the two groups (table 3).

No significant differences were encountered in age distribution as related to severity among the three subgroups of each series (table not given). Therefore the two groups were considered as a single whole in the appraising of the importance of age as a factor in severity. Of the patients in whom the outcome of treatment was poor, 72 per cent

TABLE 2.—*Specific Organisms and Agglutinations*

	Control Group	Banana Diet Group
Bacillary dysentery		
Flexner	1	7
Hiss Y	13	11
Flexner and Hiss Y	..	1
Dispar	1	1
Sonne	1	..
Strong	1	3
Type undeterminable	3	5
Salmonella		
Paratyphi A	1	..
Paratyphi B	2	..
Aertrycke	..	1
Enteritidis	1	..
Type undeterminable	6	6
Total	30	35

TABLE 3.—*Comparison of Relative Severity of Diarrhea*

	Control Group		Banana Diet Group	
	Moderate	Severe	Moderate	Severe
Parenteral	19	3	17	2
Unknown	17	10	27	16
Specific	14	17	17	18
Total	50 (62.5%)	30 (37.5%)	61 (62.9%)	36 (37.1%)

TABLE 4.—*Comparison of Results of Treatment*

	Control Group			Banana Diet Group		
	Good Recovery	Poor Recovery	Death	Good Recovery	Poor Recovery	Death
Parenteral	17	5	..	13	5	1
Unknown	16	8	3	30	11	2
Specific	20	11	..	20	14	1
Total	53 (66.2%)	24 (30%)	3 (3.7%)	63 (65%)	30 (30.9%)	4 (4.1%)

were below the age of 1 year, whereas of the total number of patients only 58 per cent were below 1 year of age. Eighty-seven per cent of the poor results were encountered in children under 2 years old, while only 70 per cent of the total number of children were below that age. Six of the 7 patients who died were less than 6 months of age. The seventh death was that of an 18 month old infant. State of maturity thus appears of great importance in the prognosis of diarrhea.

In analyzing the results it must not be forgotten that the children showed wide individual variations in age, racial origin, economic circumstances, nutritional status, environmental conditions and immediate etiologic factors of the disease. It is accordingly of interest that the results of the comparison of the two systems of dietary therapy coincided to the remarkable degree shown in table 4. It was noted, however, that the colic, tenesmus and enterospasm manifested by the older children became clinically less marked after the institution of banana feeding. Moreover, the symptoms of irritability and crying indicative of hunger were not as prominent in the group of infants to whom banana was offered as in those receiving the low caloric formulas.

More than half of the patients in both the control group and the group receiving the banana diet were recorded as having been poorly nourished at the time of admission. Since these children had not been observed before the onset of the diarrhea, it is impossible to say whether their being underweight preceded or resulted from their gastroenteritis; in many instances dehydration contributed to the clinical impression of undernutrition. All the instances in which death occurred were those of infants who had been described as malnourished when admitted.

Sick infants below 4 months of age often were too weak or too unfamiliar with the technic of spoon feeding to swallow the mashed ripe banana readily but encountered no difficulty with solutions of the banana powder. By children above this age, however, mashed pulp was usually well taken and in large amounts.

In the group treated with the 7.5 per cent solution of banana powder, one of the patients seen early in the experiment continued to have frequent stools and gradually became dehydrated in spite of an adequate fluid intake. This suggested that there might be a loss of salts in the intestinal discharges greater than the quantities supplied by the mineral content of the fruit. For this reason table salt crystals were sprinkled over the banana mash fed to most of the patients seen subsequently.

When the food intake consisted of banana exclusively, the stools were bulky, pale brown, semiformed and gummy. Mashed banana and banana powder preparations gave rise to stools of similar appearance, except that in the stools of children receiving banana in powder form the black fibrils were not evident on gross inspection. In the presence of enterocolitis the boli were ordinarily semiformed or formed, although containing mucopus and flecks of blood. Extensive studies on their bacteriologic flora have been reported,[9] but information on the chemical composition of the stools of banana-fed infants has not been gathered.

9. Kahn, B. S.: The Effect of Banana Powder Feeding on the Fecal Flora of Infants, Arch. Pediat. **50**:330 (May) 1933. Weinstein, L., and Bogin, M.: The Effect of Banana Feeding on the Intestinal Flora and on Constipation in Children and Adults, Rev. Gastroenterol. **6**:21 (Jan.-Feb.) 1939.

SUMMARY AND CONCLUSIONS

The results of a two year trial of the use of banana in the treatment of diarrhea are reported. The clinical material consisted of: (1) 97 infants and children who were given mashed banana or banana powder as the principal food and (2) a control group of 80 patients who received a variety of recognized therapies. There were no significant differences within the two groups as regards age, etiologic factors, severity of infections, state of nutrition and mortality rates.

Banana feeding in the treatment of diarrhea was found to be as effective as the older and more usual feeding regimens. The results of treatment as clinically evaluated were essentially identical in the two groups of patients.

It was noted that banana was well taken and that the patients receiving it were usually relieved of hunger, tenesmus and abdominal discomfort and passed semiformed stools.

A banana diet may be considered a sound method in the therapeutic management of diarrhea.

Dr. Robert Fredeen and Dr. David Pewterbaugh assisted in the care of the patients.

INFLUENCE OF SYPHILIS ON INTELLIGENCE OF CHILDREN

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In a recent extensive review, Menninger [1] considered the relation between feeblemindedness and congenital syphilis from two angles: the percentage of congenitally syphilitic persons who are feebleminded and the percentage of feebleminded persons who have congenital syphilis.

With respect to the incidence of feeblemindedness among congenitally syphilitic persons, Menninger collected nine studies. Except for an incidence of 1.8 per cent reported by Hutchinson in 1863, the values for the incidence ranged from 7 per cent of 148 cases (Still) to 57.2 per cent of 42 cases (Breuer), with a median value of 24.5 per cent and a mean value of 28.8 per cent. Menninger stated: "A serious disqualification of these studies is the failure of the authors to establish definite criteria of the concept of feeblemindedness or mental deficiency used by them." Some apparently included all instances of the mildest degree of mental retardation recognized. It must be remembered that about 50 per cent of normal children fall below the average.

When one considers the incidence of syphilis among mentally defective persons a larger volume of material is found.

In 1925 Dayton [2] published an excellent review in which he tabulated the results of many investigators who had reported the results of Wassermann examinations of the blood of a total of 13,761 mentally defective persons and 25,576 mentally normal persons. The incidence of congenital syphilis in the total of the former group as indicated by the Wassermann reaction was placed at 7.8 per cent; in the latter group, at 5.3 per cent.

Studies from the Institute for Juvenile Research, Series C, no. 276.

From the New York Training School for Boys (Dr. Jenkins) and the Institute for Juvenile Research (Dr. Brown).

1. Menninger, W. C.: Juvenile Paresis, Baltimore, Williams & Wilkins Company, 1936.

2. Dayton, N. A.: Syphilis in the Etiology of Mental Deficiency, Ment. Hyg. 9:760 (Oct.) 1925.

Dayton [2] reported the number of those having a positive reaction of the blood among 1,631 subjects at the Wrentham State School as 57, or 3.4 per cent. Of these, 7 (0.4 per cent of the total) presented acquired syphilis; 15 (0.9 per cent of the total), a history of other instances of mental deficiency in the family, and 7 (0.4 per cent of the total), a history of mental disease in the family. For the remaining 28 (1.7 per cent of the total), who presented congenital syphilis, there were no known factors which might be considered causative other than syphilis. Dayton concluded: "This analysis and its resulting figures tend to revise our estimate of syphilis as a cause of mental deficiency and to place this disease among the negligible factors."

In a later communication Dayton [3] reported that at the Wrentham State School the average intelligence rating of 61 mentally defective subjects with congenital syphilis (average intelligence quotient, 53) definitely tended to be above the average rating of 1,956 mentally defective subjects with negative Wassermann reactions (average intelligence quotient, 46). He concluded that, considered statistically, "congenital syphilis does not produce large numbers of cases of mental deficiency" and that when intelligence is considered, "congenital syphilis does not produce a low grade of defect."

Menninger [1] reviewed not only the studies based on the serologic reaction but also studies based on the clinical diagnosis. In twelve studies made before serodiagnosis the incidence of syphilis in mentally defective persons ranged from 0 to 21 per cent, with a median of 2 per cent and a mean of 5.1 per cent. In thirty-nine studies made after serodiagnosis the percentages ranged from 0 in 31 cases to 66 in 29 cases, with a median of 15.4 and a mean of 22.5. The disparity between median and mean in these series reflects the influence of a small number of observers who reported extremely high incidences. In the eight studies respectively involving more than 900 cases (and based chiefly on the serologic reaction) the percentages ranged from 1.5 to 8.5, with a median of 4.8 and a mean of 4.6.

Menninger called attention to four significant points:

1. The differences are in part to be accounted for by differences in the criteria of diagnosis, some studies being solely serologic.

2. Whatever the criteria, a great increase in the incidence of syphilis has been reported since pre-Wassermann days.

3. The series of feebleminded persons in various studies as well as the criteria of syphilis are different, often inadequate and often unstated.

4. "These figures, above all, reflect the subjective attitude with which the problem is approached. Psychologically, it is apparent that some

3. Dayton, N. A.: Degree of Mental Deficiency Resulting from Congenital Syphilis, J. A. M. A. **87**:907 (Sept. 18) 1926.

investigators use syphilis in the sense that primitive man used the taboo, or mana, i. e., as a magic touchstone which solves the otherwise impossible problem; these men see syphilis everywhere and probably overestimate its frequency. Others are unconsciously impelled to shut their eyes to what for them is a painful subject, and probably under-estimate its frequency and importance."

We are inclined to believe that the last-mentioned observation is the most important in explaining the difference. It is noteworthy that the differences in results between investigators using serologic technics are less than the differences between those who depended heavily on clinical diagnosis. As Menninger pointed out, serologic tests are not adequate in recognizing all cases of syphilis. On the other hand, it might be added, they have the virtue of being less readily influenced by the last type of consideration listed. Imperfect as the serologic tests are, the difference between a mean of 4.6 per cent and a mean of 22.5 per cent (Menninger) certainly reflects sources of error much greater than those in the serologic tests.

Menninger continued:

> In concluding the consideration of the relation between feeblemindedness and syphilis, one must recognize that mental deficiency is a symptom of syphilis in many cases, and a negative or a positive blood Wassermann does not establish this relationship. Wassermann surveys alone only show that a positive reaction is an inconstant symptom of congenital syphilitic feeblemindedness.

Aside from the assumption that the difference between the results of serologic and clinical studies is to be entirely accounted for in terms of errors in the serologic studies, Menninger apparently did not give due consideration to the possibility that the relation between syphilis and mental deficiency is other than a causal one. In view of the fact that parents of low mentality may both acquire syphilis and beget defective children, and indeed are likely to do both, the assumption that the relation between congenital syphilis and mental deficiency is to be interpreted as causal may be challenged. Unfortunately, Menninger did not mention by what device he was able in his own conclusions to avoid being influenced by the type of prelogical thinking to which he called attention.

Menninger included no mention of the excellent review and discussion by Myerson.[4] The discussion contained the report of a study of the families of 59 subjects classified as "congenital syphilitic feebleminded" at the school for the feebleminded at Waverley, Mass. Of the 41 cases in which siblings could be located, the sibships included other feebleminded children in 15 instances. The discussion following has seemed so important and illuminating that we quote it at some length.

4. Myerson, A.: Researches in Feeble-Mindedness with Special Relationship to Inheritance: VII. Syphilis and Feeble-Mindedness, Bull. Massachusetts Dept. Ment. Dis. **14**:151 (April) 1930.

Though the number 59 is a small one and statistical evaluation is on the whole difficult in so small a group, yet the extraordinarily large number of feeble-minded siblings cannot be without significance. If one contrasts these figures with the figures of the cretins, the Mongolians, and the spastics the difference at once becomes striking. In the case of the former groups the number of feeble-minded siblings is hardly more than one would expect. In the case of the so-called congenital syphilitic feeble-minded, the number of siblings who are feeble-minded is far greater than what one would expect.

This hereditary trend becomes at once strengthened by the study of the parents of the syphilitic feeble-minded. There were fifteen cases where the parents were unknown, which again does not load the statistics in favor of these parents being normal; but on the contrary, from what we know of social life, loads it in the other direction, namely—that they were abnormal, and probably low grade. In fourteen cases, there occurred definite feeble-mindedness among the parents of the syphilitic feeble-minded. In nineteen cases, the parents were definitely stated to be normal. In eleven cases, the parents were stated to be of low grade and feeble-mindedness was suspected. *Thus there occurred a tremendous amount of low-grade mentality and of feeble-minded mentality amongst the parents of this group of syphilitic feeble-minded.* Again, if one contrasts this with the familial situation of the cretins, the Mongolians, and the spastic or organic brain cases the difference is striking. In the former groups of cases there was very little parental feeble-mindedness. In this last group the amount is noteworthy. In other words, the number of feeble-minded to be expected from this group of people, *irrespective of any syphilis at all,* would be high if there is anything at all in the inheritance of feeble-mindedness. In fact, in the most of these cases if the Wassermann reaction had not appeared upon the scene as a method for discovering latent syphilis, syphilis would not have been expected and the onus of the feeble-mindedness would have been placed on heredity.

When we study the sex life of the parents of these syphilitic feeble-minded, the amount of promiscuity of sexual relationship at once explains the incidence of syphilis in this group. Of the 41 cases in which the sex life was determined, classified as to promiscuity and non-promiscuity, *fifteen cases of parental promiscuity were discovered.*

Several of these individuals were definitely known to be prostitutes; others had had illegitimate children; many had been arrested for sexual irregularities. We did not class under promiscuity those individuals whose sex life had merely been irregular; we only classed under this heading such lives in which the lack of sexual discrimination had been outstanding.

Among the conclusions of the report are the following:

A very large proportion of this group of feeble-minded come from families in which there is much feeble-mindedness; in other words, if there is a hereditary element in feeble-mindedness, it may be held responsible for a large proportion of the cases labeled congenital syphilitic feeble-minded.

The social stratum and the way of life of the parents of these feeble-minded would lead one logically to expect a large percentage of syphilis amongst their descendants, irrespective of the feeble-mindedness.

While it cannot be doubted that syphilis causes alterations of the brain, and thus produces *dementia* both in the adult and in the child, there is no proof at present that syphilis causes feeble-mindedness. There is nothing in the general appear-

ance and the general reactions of the congenital syphilitic feeble-minded to distinguish them from the mass of the feeble-minded. Therefore, there is ground for the assertion that, at the present time, we can safely state that syphilis of ancestors causes little, if any, feeble-mindedness in descendants.

Certain studies not reviewed by Dayton, Myerson or Menninger are of interest.

Pastori [5] published the results of a study of 209 abnormal or backward children and reported that 44 (21.1 per cent) definitely presented congenital syphilis and 55 (26.3 per cent) additional ones probably presented it, making a total of 99 (47.4 per cent).

Kilgour [6] reported 17 cases of syphilis (15.5 per cent) among 110 mentally defective persons in the Chicago State Hospital. In 13 cases (11.8 per cent) the condition was classified as congenital syphilis and in 4 cases as acquired syphilis occurring in mentally defective persons of the moron level.

Potter [7] carried out a study of 71 mentally defective persons with congenital syphilis. Those whose ancestry was known he divided into two groups, a group of 13 persons with heredity of mental deficiency and a group of 40 persons with no heredity of mental deficiency. The former group was characterized by a higher level of intelligence, fewer syphilitic stigmas, fewer neurologic signs, a larger number of positive Wassermann reactions of the blood and fewer positive Wassermann reactions of the cerebrospinal fluid. Potter concluded that his tables presented "indisputable evidence to the effect that congenitally syphilitic defectives and their families with a defective ancestry are far more resistant to a syphilitic infection than those with a nondefective ancestry." A more likely explanation would be that severe syphilis caused feeble-mindedness in some children with no mental deficiency in their ancestry.

Paddle [8] recently reported the results of an investigation of 402 mentally defective children, representing largely the more severe grades of mental deficiency, whose blood and cerebrospinal fluid were examined. He concluded that 37 (9.2 per cent) presented congenital syphilis. The cerebrospinal fluid of 12 (3.0 per cent of the total) was abnormal. That of 5 (1.2 per cent of the total) "gave strong paretic types of curve, associated with positive Wassermann reactions, increase of cells and pro-

5. Pastori, G.: Sulla frequenza della eredolues nei fanciulli anormali, in Pubblicazioni dell'Universitá cattolica del sacro cuore, series 6, Milan, Societá editrice Vita e pensiero, 1924-1925, vol. 3.

6. Kilgour, G. G.: Mental Defectives in Relation to Congenital and Acquired Syphilis, Illinois M. J. **51**:330 (April) 1927.

7. Potter, H. W.: A Study of Congenitally Syphilitic Mental Defectives, Bull. Massachusetts Dept. Ment. Dis. **14**:241 (April) 1930.

8. Paddle, K. C. L.: Congenital Syphilis in Low-Grade Mentally Defective Children, Brit. J. Child. Dis. **30**:249 (Oct.-Dec.) 1933.

tein;" according to the report, none of these 5 patients could be regarded on clinical grounds as having dementia paralytica of the juvenile type.

In a subsequent paper Paddle [9] reported the results of examination of the blood of 1,598 mentally defective adults and of the cerebrospinal fluid of 1,525 of these. Among the 1,598 mentally defective adults there were diagnosed 78 cases of congenital syphilis (4.9 per cent) and 10 cases of acquired syphilis (0.6 per cent). Among those whose cerebrospinal fluid was examined (1,525), 16 with congenital syphilis (1.0 per cent of the total) and 4 with acquired syphilis (0.3 per cent of the total) presented abnormal fluid. At another time Paddle [10] stated: "I very much doubt whether congenital syphilis can be held responsible, except in rare cases, for producing mental deficiency."

Kiss and Rajka [11] reported from their studies in which the Binet test was used that 46.7 per cent of their series of 45 syphilitic children were mentally retarded one year or more, while this was true of only 20 per cent of a series of healthy children of comparable age distribution. They stressed the finding that of 11 children on whom treatment was begun before the age of 6 months, only 1 child (9.1 per cent) was retarded one year or more, while of 34 children on whom treatment was begun between the ages of 2 and 13 years, 20 children (58.8 per cent) were retarded one year or more. Unfortunately, they said nothing about the age at which the children were tested, and without a statement of that age these figures are meaningless. Obviously, the children who were 13 years of age at the commencement of treatment must have been at least 13 years of age at the time of the test, while the children on whom treatment was begun before the age of 6 months were probably much younger. The significance of a year of mental retardation is much greater in a young child than in an older one. Kiss and Rajka have marshaled no persuasive support for their conclusion that early treatment of syphilis typically prevents mental retardation.

Jenks and Donnelly [12] examined 1,000 children for syphilis. They determined the presence of congenital syphilis in 20 children and of acquired syphilis in 3 children. Two of the syphilitic children were pronounced feebleminded, and 1 was considered perhaps feebleminded; 5 were classified as "dull normal," and 1 as mentally retarded.

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9. Paddle, K. C. L.: Congenital Syphilis in Mental Defective Adults, J. Neurol. & Psychopath. **15**:147 (Oct.) 1934.

10. Paddle, K. C. L., in Discussion on Unsettled Questions of Neurosyphilis, Proc. Roy. Soc. Med. **28**:172 (Dec.) 1934.

11. Kiss, P., and Rajka, T.: Intelligenzprüfungen an Kindern mit angeborener Syphilis, Arch. f. Kinderh. **102**:25 (April) 1934.

12. Jenks, H. H., and Donnelly, J. D.: The Incidence of Congenital Syphilis Among Dependent Children, Am. J. Dis. Child. **37**:1198 (June) 1929.

Molitch and Eccles [13] reported after study of the inmate population at the New Jersey State Home for Boys (delinquent) that the incidence of subnormal intelligence in those boys with a positive Wassermann reaction of the blood was almost twice as great as that of the inmate population in general.

Yerkes [14] analyzed the scores derived from intelligence testing in the United States Army for those with and those without venereal disease. He reported a slightly lower average rating of intelligence for the group with venereal disease and concluded: "Such a difference might be more reasonably interpreted as an indication that men of inferior intelligence are more likely to expose themselves to venereal infection or less likely to employ suitable prophylactic measures." The explanation might equally well apply to the findings of Molitch and Eccles,[13] since they were dealing with a population of adolescent, delinquent boys.

Bazeley and Anderson [15] compared 60 congenitally syphilitic subjects under 15 years of age with 60 nonsyphilitic subjects matched for age, sex and nationality. Of the 60 subjects classified as having congenital syphilis, only 2 gave positive reactions of the cerebrospinal fluid. The average chronologic age of both groups was 10.3 years. The average Binet mental age of the syphilitic group was 6.2 years; of the nonsyphilitic group, 7 years. Thirty-six children of the syphilitic group and but 24 of the nonsyphilitic group were backward in school.

Various studies have been made of the mentality of persons with dementia paralytica. Some of these studies have comprised results of objective tests. Simon [16] himself was a pioneer in this field. No general review of such studies of adults with dementia paralytica will be made here. Two papers are perhaps of sufficient interest to justify mention.

Weissfeld [17] tested the mentality of 29 adult patients both before and after malarial treatment. He classified his various tests by the process to which he presumed them related. He found improvement in a majority of instances, ranging from 61 per cent in motor function to

13. Molitch, M., and Eccles, A. K.: The Relation Between Mental Level and Syphilis in Juvenile Delinquents (Boys), J. Nerv. & Ment. Dis. **81**:276 (March) 1935.

14. Yerkes, R. M.: Psychological Examining in the United States Army, in Memoirs of the National Academy of Sciences, Washington, D. C., Government Printing Office, 1921, vol. 15, p. 811.

15. Bazeley, J. H., and Anderson, H. M.: Mental Features of Congenital Syphilitics, Boston M. & S. J. **173**:952 (Dec. 23) 1915.

16. Simon, T.: Le niveau mental des paralytiques généraux, Ann. méd.-psychol. (pt. 1) **88**:385 (April) 1930.

17. Weissfeld, M.: Progressive Paralytiker vor und nach der Malariabehandlung, Ztschr. f. d. ges. Neurol. u. Psychiat. **146**:661, 1933.

78 per cent in memory. Improvement in "intelligence" occurred in 73 per cent of the patients.

Landis and Rechetnick [18] undertook a statistical analysis of the histories of 100 adults with dementia paralytica, using data recorded before and after treatment by pyrexia. Their analysis indicated memory retention and immediate recall to be the most important prognostic signs of the disease. From their figures one may express the relation between improvement in memory retention and immediate recall after treatment and general improvement in the condition of the patient on discharge as a tetrachoric correlation coefficient of + 0.93.

From his comprehensive review of dementia paralytica of the juvenile type, Menninger [1] concluded that in 40 per cent of 426 cases the subjects "were fundamentally retarded in their mental development, and thus were feebleminded before sufficient other signs and symptoms developed to establish a diagnosis of the disease." He regarded this as a manifestation of early dementia paralytica. He stated: "It is incorrect to assume that juvenile paresis 'develops' in feebleminded individuals. Consequently, it is incorrect to class this manifestation of the disease as one of the 'pre-paretic' symptoms, or these patients, in the 'pre-paretic' stage."

Louden [19] reported the results of repeated psychologic tests of an 11 year old Negro girl in whom dementia paralytica of the juvenile type developed. Previous to this illness the girl had appeared normal. Successive intelligence quotients determined over a period of twenty-six months were as follows: 58, 47, 47, 50 and 38. The mental age dropped eighteen months during this time.

In summarizing the literature, one may say that there is much evidence of a positive correlation between feeblemindedness and congenital syphilis. There is also evidence of a positive correlation between low mentality and acquired syphilis. There appears no satisfactory evidence that syphilis causes feeblemindedness. Those who, because of the correlation, attribute feeblemindedness to syphilis (and some writers have no hesitancy in concluding that the overwhelming majority of cases of feeblemindedness are caused by syphilis) have not adequately considered the probability that parents of low mentality are more likely to be infected with syphilis than are parents of high mentality and are less likely to be adequately treated if they become infected. The loading of

18. Landis, C., and Rechetnick, J.: Changes in Psychological Functions in Paresis, Psychiatric Quart. **8**:693 (Oct.) 1934.

19. Louden, M. V.: Some Behavior Changes in a Juvenile Paretic, Psychol. Clin. **22**:257 (Dec.-Feb.) 1933-1934.

our own material [20] with disorganized families of low mentality was glaring.

There is no question but that syphilis causes dementia in children as well as in adults.

PRESENT STUDY

The present study is based on cases of syphilis in children examined at the Institute for Juvenile Research. A conservative policy was adopted in accepting evidence of syphilitic infection.

Only Stanford-Binet intelligence ratings have been used in this study. In table 1 are summarized the distributions for various groups of syphi-

TABLE 1.—*Intelligence Rating (Stanford-Binet) of Various Groups of Syphilitic Children on Initial Test*

Group, According to Diagnosis * of Condition	No. of Subjects	Mean Chronologic Age, Years	Mean Mental Age, Years	Mean Intelligence Quotient
Congenital syphilis, juvenile dementia paralytica....	10	13.0	6.9	57 ± 4.65
Congenital syphilis, juvenile dementia paralytica (?)	5	10.3	5.5	57
Congenital syphilis, other involvement of central nervous system	24	13.3	7.3	58 ± 3.10
Congenital (?) syphilis, other involvement of central nervous system	7	12.6	9.5	79
Congenital syphilis, other involvement of central nervous system (?).....	20	11.5	7.8	68 ± 3.31
Congenital (?) syphilis, other involvement of central nervous system (?).....	4	14.7	8.7	62
Acquired syphilis or acquired (?) syphilis, other involvement of central nervous system.....	3	13.1	11.1	88
Acquired syphilis or acquired (?) syphilis, other involvement of central nervous system (?).....	2	15.5	7.5	55
Congenital syphilis, no evidence of other involvement of central nervous system.....	32	10.3	7.7	76 ± 2.43
Congenital (?) syphilis, no evidence of other involvement of central nervous system.....	15	11.2	8.5	77 ± 3.15
Acquired syphilis, no evidence of other involvement of central nervous system.....	8	13.7	11.5	82
Acquired (?) syphilis, no evidence of other involvement of central nervous system.....	11	15.5	10.2	71 ± 1.81

* A question mark follows any element of the diagnosis which is only tentative.

litic children with respect to chronologic age, mental age and intelligence quotient at the initial test. As might be expected with the population of a clinic for child guidance, the mean intelligence quotient is not high. It is perceptibly lower for those children with dementia paralytica and with congenital syphilis having other involvement of the central nervous system than for those without evidence of damage to the central nervous system.

In some instances we examined 2 or more children in a family of whom 1 or more of the members were syphilitic and 1 or more were

20. Jenkins, R. L., and Crudim, M.: Behavior Problems in Children with Syphilis: Relation to Juvenile Paresis, to be published.

nonsyphilitic.[21] Such comparisons are of crucial importance. This material is contained in table 2.

From their performance on a Binet test the syphilitic children appear less intelligent than their nonsyphilitic siblings, but the differences are not statistically significant in so small a series.

TABLE 2.—*Differences in Intelligence Rating (Stanford-Binet) Between Syphilitic Children and Their Nonsyphilitic Siblings Compared Individually and by Families*

Groups Compared	Compared Individually*		Compared by Families†	
	No. of Comparisons	Mean Difference in Rating‡ (Intelligence Quotient)	No. of Comparisons	Mean Difference in Rating‡ (Intelligence Quotient)
Syphilitic children with involvement of the central nervous system (other than paresis) vs. their nonsyphilitic siblings	11	+12.5±6.39	8	+18.9
Syphilitic children without evidence of involvement of the central nervous system vs. their nonsyphilitic siblings....	13	+ 9.7±4.61	9	+12.6
Total	24	+11.2±3.84	17	+15.6±4.78

* The rating of a syphilitic child compared with the rating of each of his nonsyphilitic siblings.

† The mean rating of syphilitic children in a family compared with the mean rating of their nonsyphilitic siblings.

‡ A plus sign (+) before the value indicates a difference in favor of the nonsyphilitic siblings.

TABLE 3.—*Increase or Decrease in Intelligence Rating (Stanford-Binet) on Retesting Various Groups of Syphilitic Children and of Their Nonsyphilitic Siblings*

Group, According to Diagnosis* of Condition	No. of Subjects	Mean Increase or Decrease† in Rating on Retest‡ (Intelligence Quotient)	Mean Increase or Decrease† in Rating on Retest‡ (Personal Constant)
Congenital syphilis, juvenile dementia paralytica...	8	−6.1	−4.3
Congenital syphilis, other involvement of central nervous system	18	−0.8±1.25	−0.5±1.20
Congenital syphilis, other involvement of central nervous system (?).....	15	−0.7±1.40	+1.0±0.72
Congenital syphilis, other involvement of central nervous system or (?).....	33	−0.7±0.74	+0.2±0.75
Congenital syphilis, other involvement of central nervous system or (?); or acquired syphilis, other involvement of central nervous system (?).....	36	−1.3±0.81	−0.1±0.69
Other congenital syphilis.....	18	+0.6±1.00	+0.9±1.40
Other acquired syphilis.....	9	+0.3	−0.2
Other congenital syphilis or other acquired syphilis	27	+0.5±0.91	+0.5±0.97
Nonsyphilitic siblings of foregoing syphilitic children	7	+7.7	+5.6

* A question mark follows any element of the diagnosis which is only tentative.

† A plus sign before the value indicates increase in rating on retest; a minus sign, decrease in rating on retest.

‡ First test compared with second test, second test compared with third test, etc.

In a fraction of the cases of our series there were retests. The mean increase or decrease in the intelligence quotient on retesting is indicated in the second column of table 3. Results of tests given within three

21. Children in whom no clinical sign of syphilis were present and whose serologic reaction of the blood was negative were accepted as nonsyphilitic.

months of a previous test were not used, to avoid the effect of too recent practice. The number of subjects on whom the comparisons are based is indicated in the first column of the table. The results in the third column are analogous to those in the second column, but the personal constant (Heinis) is used as an index of intelligence in place of the intelligence quotient.[22]

A decrease in intelligence rating on retesting is apparent for the group with dementia paralytica. The mean decrease is 6.1 points in the intelligence quotient and 4.3 points in the personal constant. None of the other groups, including the nonsyphilitic siblings, shows any appreciable tendency to decrease.

CONCLUSIONS

A study of results of objective tests of intelligence in a limited series indicates that dementia paralytica of the juvenile type causes a decrease in intelligence rating.

Examination in a limited series suggests that syphilitic children, particularly those with involvement of the central nervous system, tend to be intellectually inferior to their nonsyphilitic siblings.

22. Brown, A. W.; Jenkins, R. L., and Cisler, L. E.: Influence of Lethargic Encephalitis on Intelligence of Children, Am. J. Dis. Child. **55**:304 (Feb.) 1938.

Case Reports

HAND-SCHÜLLER-CHRISTIAN DISEASE

REPORT OF A CASE IN WHICH URINARY ANDROGENS WERE TITRATED

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AND
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Rowland [1] has suggested that Hand-Schüller-Christian disease is due to a primary constitutional alteration in the metabolism of lipoids, which results in an excessive accumulation of lipoids in the blood and in other tissue fluids and which gives rise to a massive storage or infiltration in various tissues of the body. Thus, this disease is viewed as belonging to a general group of lipoid disturbances which includes Niemann-Pick disease, Gaucher's disease and cutaneous xanthomatosis.

Most descriptions of the condition refer to associated alterations in endocrine functions. Christian [2] regarded the disease as an "unusual syndrome of dyspituitarism." Diabetes insipidus, a common symptom, suggests possible involvement of the intermediate and the posterior lobes of the pituitary. The fact that the disease has been associated with intercurrent acromegaly, with adiposogenitalism, with dwarfism accompanied by genital hypoplasia and with pituitary cachexia (Simmonds' disease) is an additional reason for the belief that the pituitary is involved in the pathologic manifestations. Since cholesterol, which is regarded as the most likely precursor of the various sex sterols, characteristically occurs in increased amounts in the blood, it seems likely to expect some alteration in the metabolism of the sex sterols in patients with this disease.

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1. Rowland, R. S.: Xanthomatosis and the Reticulo-Endothelial System, Arch. Int. Med. **42**:611 (Nov.) 1928.

2. Christian, H. A.: Defects in Membranous Bones, Exophthalmos and Diabetes Insipidus: An Unusual Syndrome of Dyspituitarism, M. Clin. North America **3**:849, 1919.

The following case of Hand-Schüller-Christian disease is one in which the metabolism of the sex sterols was investigated, and it is reported since no studies of this nature had been encountered previously by us.

REPORT OF CASE

A. H., a white boy aged 29 months, was admitted to the pediatric ward of Duke Hospital on Jan. 23, 1939, because of loss of weight, a cutaneous eruption, polydypsia and polyuria. The child had developed normally until 12 months of age, when bilateral otitis media occurred. Drainage continued for the next seventeen months. The infant lost his appetite, and he ceased to grow and gain adequately in weight. His parents observed that he had an insatiable thirst and that large

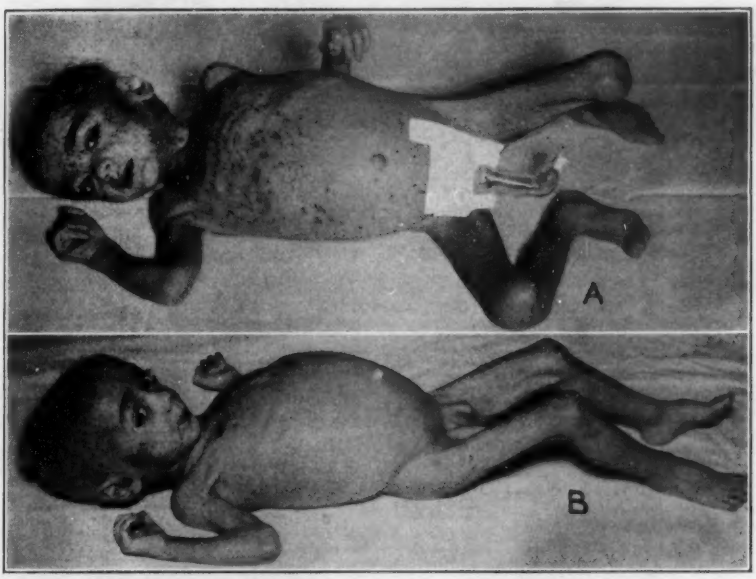

Fig. 1.—Photographs made of the patient (*A*) before and (*B*) after treatment.

amounts of urine were voided. Several months later peculiar papular, scaly lesions appeared on the face and trunk. The weakness progressed until the patient became bedfast. The polydypsia and polyuria increased.

Examination at the time of his admission showed a cachectic, potbellied, pale and wizened boy of 29 months, whose appearance in many ways resembled that of an old man (fig. 1 *A*). The temperature, pulse and respiration were normal. The height was 77.5 cm. (31 inches) and the weight 7.3 Kg. (16 pounds). The patient's head and trunk were covered with a scaly, papular dermatitis. Foul purulent material drained from both ears. His head was rather square, with prominent frontal and parietal bosses. The sutures were visible, and the veins of the scalp were prominent. The hair was sparse. Teeth were absent, and the jaws were sunken. The face was covered with an excess of soft downy hair. The eyelashes were long. There was a generalized lymphadenopathy. The mucous membranes were extremely pale. The heart and lungs were normal on auscultation and percussion. The spleen and liver were enlarged, the edges of both organs extending 3 cm. below the costal margin. Subcutaneous fat was almost absent,

and muscular development was poor. The deep reflexes were hyperactive. Except that both testes were in the inguinal canal at the level of the external ring, the genitals were normal.

Laboratory Data.—The hemoglobin content was 30 per cent (Sahli); the red blood cell count was 1,700,000, and the white cells numbered 5,700; there were no abnormal cells. Urinalysis gave negative results; the specific gravity was 1.003.

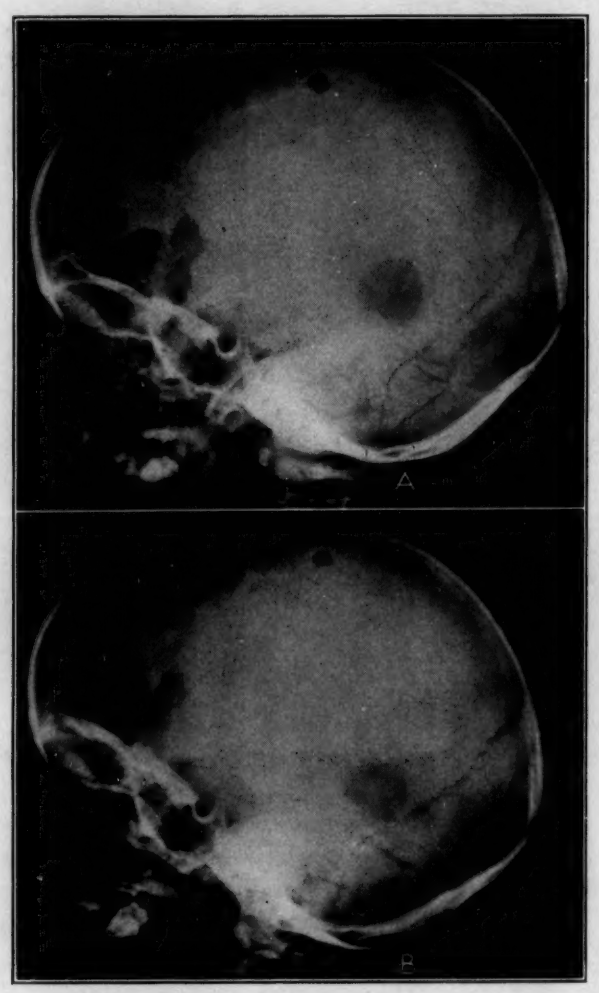

Fig. 2.—Roentgenograms made of the skull (*A*) before and (*B*) after treatment.

The Wassermann reaction of the blood was negative. The cholesterol content was 175 mg. per hundred cubic centimeters; the calcium content, 9.6 mg.; the phosphorus content, 5.7 mg.; the nonprotein nitrogen content 29 mg.; and the total protein content, 6.7 mg. The refractive index was 1.3493.

Roentgenographic Studies.—The heart and the lungs were normal; the long bones were normal. The osseous age was compatible with the chronologic age. Many rounded defects of various sizes were present in the cranial bones, typical

of diffuse xanthomatosis (fig. 2 *A*); there was destruction of almost the entire sphenoid, with no evidence of attempted regeneration; the lumbar portions of the spine and pelvis were normal.

Biopsy.—Skin and subcutaneous tissue from an area on the chest wall which showed the typical dermatitis was studied by Dr. Roger D. Baker. He regarded

TABLE 1.—*Titration of Urinary Hormones*

Date, Year 1930	Total Volume Urine, Cc.	Sodium Pregnandiol Glucuronidate, Mg.	Androgens, International Units
Before or during early part of therapy			
1/30–1/31*	1,565	0.0	16.0
1/31–2/ 1	2,410	0.0	34.0
2/ 1–2/ 2*	1,580	0.0	47.0
2/ 2–2/ 3	2,970	0.0	40.0
2/ 3–2/ 4*	1,610	0.0	58.0
2/ 4–2/ 5	2,300	0.0	54.0
2/ 5–2/ 6*	2,730	0.0	59.0
2/ 6–2/ 7	2,920	0.0	52.0
2/ 7–2/ 8*	2,970	0.0	46.0
2/ 8–2/ 9	1,510	0.0	38.0
2/ 9–2/10*	2,880	0.0	13.0
2/10–2/11	2,670	0.0	41.0
2/11–2/12*	1,800	0.0	25.0
2/12–2/13	1,500	0.0	20.0
2/13–2/14*	2,450	——	31.0
2/14–2/15	3,000	Total 0.0	46.0
2/15–2/16*	1,550		38.0
2/16–2/17	2,360	.....	24.0
2/17–2/18*	1,420	.....	56.0
2/18–2/19	900	.....	11.0
2/19–2/20*	800	.....	13.0
2/20–2/21	1,735	.....	40.0
2/21–2/22*	2,150	.....	50.0
2/22–2/23	3,610	.....	104.0
		Total	961.0
		(Average per determination	40.0)
After therapy			
3/27–3/28	2,590	.....	23.0
3/28–3/29	1,470	.....	29.0
3/29–3/30	2,800	.....	29.0
3/30–3/31	2,320	.....	31.0
3/31–4/ 1	3,140	.....	31.0
4/ 1–4/ 2	2,700	.....	19.0
4/ 2–4/ 3	2,460	.....	19.0
4/ 3–4/ 4	2,230	.....	24.0
4/ 4–4/ 5	1,530	.....	24.0
4/ 5–4/ 6	2,440	.....	19.0
4/ 6–4/ 7	3,150	.....	19.0
		Total	267.0
		(Average per determination	24.0)

* Specimens on which quantitative assays of gonadotropic (follicle-stimulating) substances were done. All the assays gave negative results throughout for amounts in excess of 2.5 rat units per twenty-four hour specimen.

the histopathologic picture to be characteristic of xanthomatosis. Definite "foam cells" were identified.

Titration of Urinary Hormones.—Through the diligent cooperation of Miss Mildred M. Sherwood and her assistants on the nursing staff it was possible to secure twenty-four hour specimens of urine for estimation of hormonal titers daily from January 30 to February 23 inclusive and from March 27 to April 7 inclusive. The content of sodium pregnandiol glucuronidate (an excretion product of

progesterone) was estimated by the gravimetric method of Venning.[3] The urinary androgens were determined by the colorimetric method of Oesting.[4] Follicle-stimulating gonadotropic substances were tested for by methods of bioassay. The data secured from these studies are summarized in table 1.

Course and Treatment.—The polydypsia of the patient was apparent; he drank between 3 and 5 liters of fluid daily, and he would have taken more if the opportunity had been offered. The urinary output kept pace with the fluid intake (table 1). A dose of 1.5 cc. of pitressin given intranasally by nebulizer daily for two weeks reduced the polyuria, but a severe rhinitis made subcutaneous injections of 0.2 cc. twice daily necessary. A diet low in fat with adequate vitamins was instituted. Several blood transfusions were given because of the anemia.

Roentgenotherapy of the skull and trunk was begun January 25 and was given daily until February 4 with the following dosages: (1) 200 kilovolts, anode-skin distance 30 cm., 20 milliamperes and filter 0.2 mm. of tin; (2) 200 kilovolts, anode-skin distance 100 cm., 20 milliamperes and filter 0.5 mm. of copper. Two additional treatments were given, on March 15 and 16, with the following dosage: 100 kilovolts; anode-skin distance 20 cm., 5 milliamperes and no filter. In all, 1,200 roentgen units of therapy was given. Roentgenograms of the skull on March 14 (fig. 2 *B*) showed a definite filling in of bone around most of the large defects and around the smaller areas in the parietal bones.

A dose of 6 mg. (1/10 grain) of thyroid was given daily by mouth from February 6 to April 8. Gonadotropic factor and growth complex (Ayerst, McKenna and Harrison) in doses of 0.5 cc. each were given by injection daily from February 17 to April 8,.

The dermatitis disappeared (fig. 1 *B*); the anemia was improved; the polyuria was reduced; 1½ pounds (0.68 Kg.) of weight was gained, and the patient was discharged from the hospital April 8. Endocrine therapy was continued. The patient has not returned for observation, but his physician reports continued improvement.

COMMENT ON ENDOCRINE ASPECTS OF THE CASE

The blood cholesterol content was not as high in this case as it frequently is. The other classic symptoms and signs of a generalized xanthomatosis, however, were present. The hypercholesteremia was not apparently associated with any disturbance in thyroid function, as roentgenograms indicated no osseous retardation.

In a disease characterized primarily by a disturbed metabolism of lipoids, it was not surprising to find alterations in the urinary titers of androgens. Changes in estrogenic values might have been encountered, had estimations been made.

The average daily excretion of 40 international units of androgen is at least ten times as high as might be expected in normal boys of the

3. Venning, E. H.: Gravimetric Method for Determination of Sodium Pregnandiol Glucuronidate (Excretion Product of Progesterone), J. Biol. Chem. **119**:473 (July) 1937.

4. Oesting, R. B.: A Colorimetric Assay for Male Sex Hormones in Urine, Proc. Soc. Exper. Biol. & Med. **36**:524 (May) 1937.

same age; with the same method, Oesting and Webster [5] found daily androgenic titers of 2.7 to 4.0 units in normal boys 3 to 3½ years of age and 2.7 to 24 units in boys 3 to 15 years of age.

While sodium pregnandiol glucuronidate (a metabolic excretion product of progesterone) is present normally during the luteal phase of the menstrual cycle of normal women during the active sexual period and during pregnancy, it does not occur normally in the urine of males. It is likely, however, that it may occur in the urine of males with adrenal tumors, and it is said to be excreted by males after injection of progesterone. The negative results of the tests for sodium pregnandiol glucuronidate in the urine of this patient indicate that no disturbed metabolism of sex sterols of this degree was associated with the general upset in cholesterol metabolism.

The data regarding gonadotropic titers indicate that no hyperfunction of the pituitary gland existed. As a matter of fact, the disease is characterized commonly by the opposite alteration (hypofunction) of the pituitary. Since the lowest concentration of gonadotropic substance was 2.5 rat units per twenty-four hour specimen, which is said by some workers to be about the normal value for infants and children, no conclusions are permitted from these data as to the existence of pituitary hypofunction.

An explanation of the excessive urinary excretion of androgens by this patient is difficult, unless it is regarded solely as another expression of disturbed metabolism of cholesterol. It should be borne in mind that the colorimetric method employed does not convey any information regarding the chemical configuration of the sterols identified or their pharmacologic activity. It is obvious that no virilizing or sex-maturing influences were being exerted by these androgens; so a diagnosis of adrenogenitalism probably can be excluded. By way of contrast, we recently encountered average daily androgenic titers of 14 international units in the urine of a boy of 18 months who presented typical symptoms and signs of an infant Hercules.

One cannot, therefore, regard these titers as being indicative of hypercortical or hypergonadal activity. The fact that the average androgenic titers were reduced from 40 to 24 international units by therapy (chiefly roentgenologic), which resulted in definite clinical improvement, lends support to the belief that these abnormal titers were not primarily of endocrinal import but rather were due to the general disturbance in lipoid metabolism.

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5. Oesting, R. B., and Webster, B.: Sex Hormone Excretion of Children, Endocrinology **22**:307, 1938.

Urinary titers of the sex sterols should be investigated in the cases of patients with syndromes characterized by xanthomatosis. If possible, the chemical nature and the pharmacologic activity of the sterols found in each case should be identified.

It seems likely that the involvement of the endocrine system in Hand-Schüller-Christian disease is secondary to the general disturbance in lipoid metabolism. The alterations in the metabolism of sex sterols is probably not associated with any striking changes in the function of the adrenal gland or of the gonads. Alterations in pituitary function doubtlessly result from xanthomatous infiltrations into and about the pituitary.

SUMMARY

The excretion of androgens in the urine of a 29 month old white boy with Hand-Schüller-Christian disease was approximately ten times normal. This was related to the general disturbance of lipoid metabolism, rather than to an excessive activity of the gonads or of the adrenal cortex. No sodium pregnandiol glucuronidate was excreted.

LACUNA SKULL (LÜCKENSCHÄDEL)

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Lacuna skull is an anomaly of the cranium usually associated with spina bifida or meningocele and occasionally with encephalocele. West, an Englishman, first described lacuna skull in 1875, as it occurred in a child 2 years of age. Engstler, in 1905, described the condition more fully and discussed the etiology. In the more recent literature several cases have been reported. Rothbart, of Detroit, gave an excellent review and discussion in 1936.[1]

As far as can be determined by a search through the literature, in no case previously reported has the condition been known to continue into adult life. The majority of patients afflicted with lacuna skull succumb during early infancy to either hydrocephalus or intercurrent infection.[1] The following report of a case should be of interest, for it is that of a patient who has reached the age of 17.

REPORT OF A CASE

R. M., a boy 13 years of age, was first seen at the clinic in January 1936, because of poor vision, malnutrition and incomplete development of the skull. The parents and 5 siblings were living. The patient, the fourth of 6 children, had a normal birth at term and was breast fed for twelve months; he walked and talked at the age of 13 months. He had a fractured nose at 3 years of age and measles and whooping cough during childhood.

Physical Examination.—On admission the boy was 55 inches (1,676.41 cm.) in height and weighed 56½ pounds (28.21 Kg.). The forehead was prominent, the bridge of the nose was flattened and the facial expression was mongoloid (fig. 1). The skull was not enlarged, and over the occiput were several palpable defects within an area about 4 inches (10 cm.) in circumference. The skull in general was soft and rather plastic, and compression elicited pain and dizziness. The vision was 20/200 in each eye; the eyegrounds were normal. There was a high arched palate. Examination otherwise gave negative results.

Roentgen Examination.—Anteroposterior and lateral roentgenograms revealed a large bony defect over the entire occipital area. The other cranial bones were channeled with gaping suture lines and linear defects. The entire cortex was thinned considerably (fig. 2).

From the Caylor-Nickel Clinic.

1. Rothbart, H. B.: Lacunar Skull of Newborn, Am. J. Dis. Child. **52**:1375-1389 (Dec.) 1936.

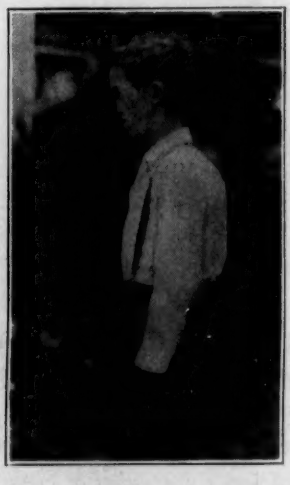

Fig. 1.—The patient in August 1937, at the age of 14 years. The prominent forehead, mongoloid expression and flattening of the occiput are well illustrated.

Fig. 2.—Lateral roentgenogram of the patient's skull, taken in January 1936, showing lacunas and a large bony defect over the occiput.

Roentgenograms of the skull taken in August 1937 (approximately eighteen months later) were essentially the same except for slight evidence of calcification in the cortex of the entire skull (fig. 3).

Laboratory Findings.—The urine was normal. Examination of the blood revealed: hemoglobin, 83 per cent (Sahli); red blood cells, 4,080,000, and white blood cells, 6,600, with a differential count of 46 per cent lymphocytes and 56 per cent neutrophils. The Kline test was negative. The calcium content of the blood was 8 mg. per hundred cubic centimeters and the phosphorus content 4 mg.

Course.—On subsequent visits the patient showed little change except for improvement in vision. In August 1937, the vision was 20/65 in each eye. The child had grown 8 inches (20.3 cm.) and had gained 3 pounds (1.3 Kg.) in

Fig. 3.—Lateral roentgenogram taken in August 1937, showing a slight increase in calcification of the calvarium.

eighteen months. He had been attending high school and apparently was a good student. Palpation and roentgen examination revealed no change in the defects of the skull.

COMMENT

Lacuna skull is a cranial anomaly characterized by defects in the vault in the form of shallow depressions or deep cavitations extending to the outer surface. The thinned areas are lined by dura and bordered by thick ridges of bone. In the majority of cases there is spina bifida with meningocele or encephalocele. A skull so affected is soft and plastic on palpation, especially in the frontal and the parietal area, where the defects are most commonly present.

Several authors have called attention to the peculiar mongoloid expression of patients with lacuna skull.[2]

The abnormalities in lacuna skull are distinctly and readily visible on roentgen examination. Some authors have made the diagnosis while the infant was still in utero.[3] The most striking feature revealed by roentgen examination is the variation in density of the skull bones, which appears as patches of rarefaction, or lacunas, with interlacing ridges of increased density. This gives the skull the honeycombed appearance characteristic of the condition.

Pathologic descriptions of such skulls reveal that the outer surface is smooth, the cranial defects being covered with a stout, parchment-like membrane or a thin layer of bone. The inner table is a rough, irregular surface with many interlacing columns of bone surrounding oval depressions. These lacunas vary from slight depressions to hollows completely penetrating the calvarium.

The cause is unknown but is believed to be (1) a primary disturbance in the development of the membranous bones of the calvarium, produced by ischemia, as well as (2) an increase in intrauterine intracranial pressure leading to pressure atrophy (nutritional and pressure atrophy).[1]

No patients have been known to live as long as the one here reported. Rothbart expressed the opinion that if the patient lived long enough the defects in the skull would undergo calcification.[1] There has been no such change in this case.

SUMMARY

A case of lacuna skull in a boy who has reached the age of 17 is reported. The patient has no accompanying meningocele or encephalocele and is of interest because most patients with this cranial anomaly succumb in infancy to either hydrocephalus or intercurrent infection.

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2. (*a*) Kerr, H. D.: Cranium in New Born with Special Reference to "Relief" or "Lacuna Skull" (Lückenschädel), Am. J. Roentgenol. **30**:458-463 (Oct.) 1933. (*b*) Doub, H. P., and Danzer, J. T.: Lückenschädel (Relief or Lacuna Skull) of Newborn, Radiology **22**:532-538 (May) 1934. (*c*) Rothbart.[1]

3. Maier, R. J.: Prenatal Diagnosis of Lacuna Skull (Lückenschädel), Radiology **23**:615-619 (Nov.) 1934.

HAEMOPHILUS INFLUENZAE MENINGITIS

A CASE IN WHICH RECOVERY OCCURRED

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AND
ERWIN NETER, M.D.
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In 1922 Rivers [1] was able to find reports of 152 cases of meningitis due to Haemophilus influenzae in children under 2 years of age, with only five recoveries. At that time he said, "Treatments of various kinds have been used, but as far as can be determined none has accomplished much." Until recently no improvement in methods of treatment had been offered which would warrant a more optimistic statement, as is indicated by the fact that in the most recent edition of their textbook Holt and McIntosh [2] report only two recoveries in the records of the pediatric department of the Johns Hopkins Hospital.

In 1932 Ward and Fothergill [3] described 5 cases of meningitis caused by the influenza bacillus in which the patients were given a specific antiserum complemented with fresh normal serum. All of the patients died eventually, but in every patient sterilization of the cerebrospinal fluid was produced for varying periods. Encouraged by these results, Silverthorne and his associates [4] gave this serum to 36 consecutive patients with H. influenzae meningitis, and in 1937 they reported the extraordinarily low mortality of 72 per cent, as compared with a mortality for the previous ten years of 98 per cent. Other reports of recoveries from H. influenzae meningitis are almost all in the form of isolated cases.

Sulfapyridine (2-[paraaminobenzenesulfonamido]-pyridine) is the most recent addition to the armamentarium for use against the influenza bacillus, and the report of the following case is presented as an example of recovery with a treatment combining sulfapyridine and specific antiserum.

From the Children's Hospital.

1. Rivers, T. M.: Influenzal Meningitis, Am. J. Dis. Child. **24**:102 (Aug.) 1922.

2. Holt, L. E., and Howland, J.: Diseases of Infancy and Childhood, revised by L. E. Holt Jr. and R. McIntosh, ed. 10, New York, D. Appleton-Century Company, Inc., 1938.

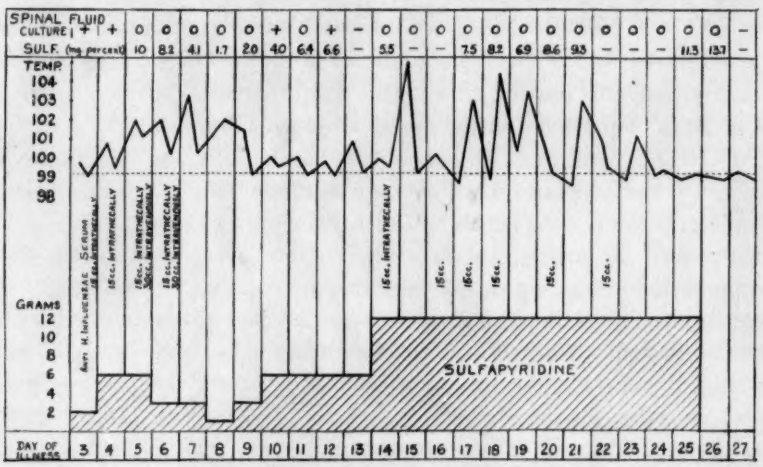
3. Ward, H. K., and Fothergill, L. D.: Influenzal Meningitis Treated with Specific Antiserum and Complement: Report of Five Cases, Am. J. Dis. Child. **43**: 873 (April) 1932.

4. Silverthorne, N.; Fraser, D. T., and Snelling, C. E.: Influenzal Meningitis, J. Pediat. **10**:228, 1937.

REPORT OF CASE

History.—W. B., a white boy aged 1 year and 6 months, was admitted to the Children's Hospital on April 19, 1939. The child was well until thirty-six hours before being admitted to the hospital, when his mother noted that his appetite was poor and that he was unusually quiet. That night he felt hot to the touch, and the next morning he complained of sore throat. He soon became mentally confused and later in the day lapsed into a state of semicoma. He remained in this condition until 9 p. m., when he had three short convulsive seizures at intervals of several minutes.

Physical Examination.—Examination on April 19 showed a well developed and wall nourished child (weight, 23 pounds [10.4 Kg.]) in coma and breathing deeply. The temperature was 100 F. by rectum; the pulse rate was 120 and the respiratory rate 45 per minute. The neck was rigid; the lower extremities were stiff, and the Babinski sign was present bilaterally. The throat was markedly inflamed; the



Data on the case reported in which sulfapyridine and specific antiserum were given to a patient with H. influenzae meningitis. At top is shown results of daily spinal fluid cultures and the concentration of sulfapyridine in the spinal fluid. Below this is a line indicating the maximum and minimum daily rectal temperature. Days on which intravenous and intrathecal injections of anti-H. influenzae serum were given are indicated. The shaded area at bottom indicates the daily dose of sulfapyridine in grams.

tonsils were large and swollen. Otherwise the results of the examination were negative.

Course.—While on the examining table the child had a brief convulsion. Lumbar puncture was performed immediately and yielded cloudy fluid under increased pressure; 35 cc. was withdrawn.

Thirty minutes later the child had a severe convulsion and became cyanotic, and it was necessary to resort to artificial respiration. During the next hour there were two additional severe convulsions, following which the pulse became imperceptible and death seemed imminent.

A dose of 15 grains (0.972 Gm.) of sulfanilamide was given by mouth every four hours.

A specimen of the spinal fluid, obtained on April 19 and from which a smear was prepared, showed many leukocytes and a moderate number of slender, gram-negative bacilli. The sugar content was 9 mg. per hundred cubic centimeters. A specific soluble substance of H. influenzae could be demonstrated in the spinal fluid. The clear supernatant fluid was mixed with anti H. influenzae serum in a proportion of 10:1. Within a few minutes, a heavy precipitate occurred. The same procedure with other serums, including antimeningococcus serum, gave entirely negative results. Thus a diagnosis of H. influenzae meningitis could be made within a few minutes after the spinal fluid had been received in the laboratory. The culture of the spinal fluid on chocolate–ascitic agar plates, which were incubated in a jar containing about 10 per cent of carbon dioxide, revealed a pure growth of H. influenzae.

Following the receipt of the bacteriologic diagnosis, the administration of sulfanilamide was discontinued and the administration of sulfapyridine, 15 grains every four hours, was begun. This was continued in varying doses as shown in the chart for the next twenty-two days.

Twenty hours after the child's admission, on the third day of the illness, 15 cc. of anti H. influenzae serum (sent by Dr. L. Fothergill, of Harvard University Medical School, from the Massachusetts Commonwealth) and a complement of 5 cc. of fresh human blood serum was administered intrathecally. This dose of serum was repeated on the fourth, fifth and sixth days of the patient's illness. In addition, during the fifth, sixth and seventh days, a total of 10 cc. of anti H. influenzae serum in physiologic solution of sodium chloride was given by intravenous drip.

After the first two days of treatment, cultures made from specimens of the spinal fluid were free of influenza bacilli and remained so for five consecutive days. Nor were organisms seen in the sediment of the centrifuged specimens. It is worth while to mention that the sugar content of the spinal fluid on April 26 had increased to 52 mg. per hundred cubic centimeters. However, H. influenzae reappeared in the spinal fluid on the tenth and twelfth days of the illness; whereupon, anti H. influenzae serum was again given intrathecally on the fourteenth, sixteenth, seventeenth, eighteenth, twentieth and twenty-second days. At the same time, the dose of sulfapyridine was increased to 12 Gm. per day. The spinal fluid became sterile on the fourteenth day and remained so.

Because of fear of another relapse, this large dose of sulfapyridine was continued until the twenty-sixth day of the illness, at which time the concentration in the spinal fluid had reached 13.7 mg. per hundred cubic centimeters.

After each injection of specific serum the child had a febrile reaction and became very weak and listless. Whenever the serum was omitted for a day or two, he brightened perceptibly and would stand in his crib. Therefore, because of the obviously toxic effect of the serum on the child, who was becoming very weak, sulfanilamide in an 0.8 per cent solution was substituted for the serum. It was given intrathecally in doses of 20 cc. on the nineteenth, twenty-first, twenty-third and twenty-fourth days, with less reaction on the part of the patient.

On the twenty-sixth day all treatment was discontinued, following which the temperature promptly dropped to normal levels, and the child convalesced rapidly. Spinal puncture on the thirty-first day yielded an essentially normal fluid. The child has remained well.

COMMENT

It is believed that the recovery in this case may be ascribed to the treatment as the child was virtually moribund on admission to the hospital. The relative effectiveness of sulfapyridine and specific serum in the treatment is, however, more difficult to evaluate.

It is of interest to note that while the anti H. influenzae serum was being administered, the spinal fluid became sterile. This reaction has been observed repeatedly in this hospital in patients with H. influenzae meningitis. Invariably, however, organisms reappeared in spite of continued treatment with the serum, and all the patients died. And so also in the case just presented: tests of the spinal fluid, which had yielded negative results on several occasions, again became positive for H. influenzae on the third day after treatment with specific serum was discontinued. In this particular case, however, bacteria again disappeared from the spinal fluid when treatment with anti H. influenzae serum was resumed, in combination with sulfapyridine. It may be of significance that H. influenzae reappeared in the spinal fluid at a time when the cell count of the spinal fluid had dropped almost to normal, a fact which suggests the possibility that the absence of polymorphonuclear cells in the spinal fluid may be linked with the reappearance of the micro-organisms. And it was chiefly with this in mind that a solution of sulfanilamide was given intrathecally in order to produce an irritative outpouring of pus cells, particularly since the reaction to the serum had become more severe.

Another interesting point of speculation in this case is the effect of sulfapyridine, which was given by mouth in heroic doses. Over a period of twelve days the relatively enormous amount of 12 Gm. per day was given to a child whose normal weight was 23 pounds. No vomiting or ill effects were noted. The concentration of sulfapyridine in the spinal fluid on the third day, when 6 Gm. per day were being administered, was 10 mg. per hundred cubic centimeters. Three days later, with a reduced dosage, the concentration of the drug had fallen to 1.75 mg. per hundred cubic centimeters on one day and to 2 mg. on the following day. At this time bacteria reappeared in the spinal fluid. When the dose of sulfapyridine was increased, the concentration in the spinal fluid rose again, and coincidentally the culture became sterile.

In this connection, preliminary experiments may be mentioned, which were carried out in an attempt to test the action of sulfanilamide and sulfapyridine on the viability of H. influenzae present in spinal fluid. These experiments revealed that H. influenzae remained viable in spinal fluid containing sulfanilamide in concentrations from 5 to 15 mg. per hundred cubic centimeters, even when they had been exposed to the action of the drug for twenty-four hours. In spinal fluid containing sulfapyridine, however, the organisims lost their viability, provided they were exposed to the action of the drug for twenty-four hours. Although no final conclusions can be drawn at the present time as to the relative effectiveness of sulfanilamide and sulfapyridine in the treatment of H. influenzae infections, further use of sulfapyridine seems to be warranted.

It is possible that the child's recovery in the case just reported is due to the method of treatment, combining the injection of a specific antiserum with the administration of sulfapyridine in large doses. Experimentally, Povitzky [5] showed that in mice infected with H. influenzae treatment with the combination of specific serum and azosulfamide (neoprontosil; disodium-4-sulfamidophenyl-2′-azo-7′-acetylamino-1′-hydroxynaphthalene-3′,6′-disulfonate) gave better results than treatment with either substance alone. Branham and Rosenthal [6] reported similar results in experimental meningococcic infections.

Dr. Robert S. Pratt, of Williamsville, N. Y., made the clinical diagnosis and referred the child to the Children's Hospital.

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5. Povitzky, O. R.: Immune Serum and Prontosil: Combined Treatment for Protection of Mouse Against Fatal Dose of Hemophilus Influenzal Meningitis; Preliminary Report, New York State J. Med. **37**:1748 (Oct. 15) 1937.

6. Branham, S. E., and Rosenthal, S. M.: Studies in Chemotherapy: Sulfanilamide, Serum and Combined Drug and Serum Therapy in Experimental Meningococcus and Pneumococcus Infections in Mice, Pub. Health Rep. **52**:685 (May 28) 1937.

SPEECH REHABILITATION FOLLOWING EXCISION OF THE TIP OF THE TONGUE

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It has been frequently assumed that disorders of speech caused by oral deformities are incurable if the defect persists after surgical intervention or if the deformity is inoperable. The following clinical case is presented to show the value of and possibilities for speech rehabilitation in such instances.

REPORT OF CASE

A 10 year old boy in whose speech the lip sounds p, b, f, v, m and w were substituted for all other consonant sounds was brought to the speech clinic; all the vowel sounds were normal. Examination of his mouth showed that the tongue was about half the normal width and that the tip was missing. The tongue appeared to be about one-third the normal size and had a heavy film. Further testing showed that there was practically no voluntary motion of the tongue, and it seems likely, in view of the nature of the thick coating, that there was the minimum of involuntary motion.

According to the medical report submitted by Dr. T. E. Jones, of the Cleveland Clinic, the child came to that clinic originally in 1931, at which time he had an acute diffuse glossitis superimposed on an extensive lymphangioma involving the entire tongue. On Sept. 3, 1931, radium was applied to the tongue, and a similar application was given Oct. 17, 1931. He returned for observation at various times, and while he had received considerable improvement from the radium treatment, the tongue was so large that it was felt excision of a portion of it should be done. On Nov. 9, 1932, excision of the tip and the left half of the tongue was done. Dr. Jones stated that he had not seen the patient since that time but that he was observed at the clinic on Oct. 28, 1935, and it was felt that the condition was satisfactory in view of the original condition which existed.

The following lists give the consonant sounds that were absent from the patient's speech, together with the sounds that were substituted (certain sounds are paired because one member is the voiced analogue of the other):

Absent Sounds	Substituted Sounds
t, d	p, b
n	m
th sounds	f, v
s, z	f, v
sh sounds	f, v
r	w
l	w
k, g	p, b
ng	m

From the Speech Clinic of the State Teachers' College.

The boy was sent to the speech clinic to determine whether anything could be done to improve his speech. There was originally no idea on the part of his parents and teachers that it could ever be normal. Subsequent training has shown that his speech could be not only improved but also normalized.

To one untrained in phonetics an attempt to normalize his speech might seem overambitious in view of the extensive damage to the tongue, especially the complete absence of the tip. Students of applied phonetics, however, know the value of compensatory adjustments. It is interesting as well as of great practical benefit to study from this point of view the possibility of producing the consonant sounds.

An analysis of the defective sounds discloses that the last three listed, namely, k, g and ng, are made with the back of the tongue. Since this portion of the tongue was intact, there was no reason, from a structural point of view, why those three sounds could not be made normally. When this fact was explained to the patient, he was able, with a little practice, to produce these sounds correctly.

The production of all the other sounds listed involves action of the tip of the tongue. In this particular case it is obvious that the only possible compensation for absence of the tip was the use of the blade, or middle portion, of the tongue. Moreover, it was necessary that the boy acquire the ability to move his tongue and to control its motion. The exercise and practice necessary for this ability were obtained in learning to produce the sounds described here.

The s and z sounds are normally made with the tip of the tongue close to but not touching the alveolar ridge of the upper jaw; as the stream of air is forced through this narrow space down the middle of the tongue the friction produced results in either an s or a z sound, according to whether the sound is whispered or voiced. This condition of an almost complete block at the alveolar ridge can be well met by the blade of the tongue instead of the tip. To produce these sounds the patient was therefore taught to elevate the blade of the tongue to a point near the ridge.

The sh sound and its voiced equivalent (the friction sound in measure) are similarly made, except that the tongue is drawn slightly back and the path for the stream of air is a little broader. Obviously, the partial block can also be made with the blade of the tongue. The patient also learned to make these sounds.

The next sounds attempted were t, d and n. The first two are normally produced by the forming of a complete block with the tip of the tongue touching the alveolar ridge, the building up of pressure and then the releasing of the block by a quick drawing away of the tip; as contact is broken the stream of air is explosively emitted. Such contact can be made by the blade of the tongue. By practicing under supervision the patient learned to do this.

The n sound is similar to t and d in that it requires a complete block made by the tongue tip at or near the alveolar ridge. There is, however, this difference: Whereas in the production of t and d air pressure is built up and then released through the mouth, in the formation of n, on the other hand, the mouth cavity is continuously blocked and the air stream is directed out through the nose. Hence, having learned to produce t and d, the patient encountered no great difficulty in learning to make n.

R and l are semi-vowels, and both of them are glides; that is, the tongue is ordinarily in continuous motion. In the making of r, the tongue is high on the sides with a groove in the center for the air to come down. This condition can be well met with the back or the blade of the tongue. Thus the production of this sound by the patient offered no mechanical difficulty.

In the making of l, the tip of the tongue normally must touch the alveolar ridge, or anterior part of the hard palate, thus deflecting the stream of air over the sides of the tongue. After considerable practice the patient acquired greater voluntary control of the muscles of the tongue and could thrust it forward and upward, so the blade was humped high enough to make the necessary contact.

The only consonant sounds that remained to be learned were the two th sounds (one whispered, as in *th*ick and one voiced, as in *th*e). Because they are fricatives, they require a partial (almost complete) block in the stream of air. This is normally achieved by the placing of the tongue tip in proximity to the juncture of the upper and lower teeth. One might wonder what compensation could be made in this motion for absence of the tip. By thrusting the tongue forward, however, to bring the blade into this position, the patient could make the sounds. As a matter of fact, this patient can now even protrude the tongue in this manner slightly beyond the teeth.

All of the consonant sounds can be made as described with little if any acoustic deviation. At present, the patient is able to use all of these sounds in single words.[1] That is evidence of the fact that he will be able to speak normally with more supervised practice.

It is of great interest that with this use and exercise of the tongue, its appearance has changed markedly. It no longer seems greatly under normal size, and the film has entirely disappeared.

COMMENT

The presentation of this clinical case does not imply that all defects of speech caused by oral deformities can be entirely removed. It does suggest that many conditions which are often considered hopeless can respond to the skilful use of the technics of speech rehabilitation.

1. Phonographic recordings have been made in the clinic, showing both the original speech and the production of correct sounds in single words.

Progress in Pediatrics

THE CLINICAL PICTURE OF TUBERCULOSIS IN CHILDREN

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The diagnosis of first infection tuberculosis is rarely made by the clinical picture. In most cases it is first discovered by a history of contact with a patient with tuberculosis, by a positive reaction to a tuberculin test or by roentgenogram. Unfortunately the diagnosis is often made and the child is treated solely on the basis of the roentgenologic classification. It is certainly not my purpose to belittle the use of roentgenograms for diagnosis. However, even if the initial diagnosis often has to be made by roentgen ray study, there is a real clinical picture of tuberculosis in the child.

Tuberculosis is an infectious disease showing in many respects the same basic pattern which is associated with many other infectious diseases, such as typhoid fever and meningococcic meningitis. There are for all a known portal of entry, known symptoms of invasion and a period in which the causative organism circulates by way of the blood stream, possibly reaching all parts of the body. This period is usually short, but it may be prolonged or extensive. Usually the attack is then concentrated in one place, and the disease goes on to exhibit the characteristics by which it is known. This is true of pneumonococcic pneumonia, of typhoid fever and of meningococcic meningitis. It is equally true of tuberculosis. Complications may develop by local spread of the disease or by metastasis from the original focus. Again, this evolution of the disease may apply equally to most infectious diseases. But tuberculosis does differ from these other infections. The others run their courses in a relatively short time, whereas the original lesions of tuberculosis may remain active for years. Moreover, in most infectious diseases there is a tendency for metastases to develop within a short time or not at all. Metastatic foci of tuberculosis may speedily develop into a tuberculous disease, such as tuberculous dactylitis in infants. Often, however, there is a long quiescent period, and after the primary focus has become stabilized or has even healed, active tuberculous disease may develop from a metastasis.

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In order to interpret the clinical picture it is necessary to keep clearly in mind an outline of the pathogenesis of tuberculosis. The usual portal of entry is the upper part of the respiratory tract. In New York extrapulmonary primary infections are uncommon, occurring in less than 1 per cent of the patients at Bellevue Hospital. When tubercle bacilli are first inhaled they usually settle just under the pleura in the best ventilated parts of the lungs. A tuberculous lesion results at this point, and soon after the initial tubercle is formed the bacilli find their way into the lymphatics and are carried to the regional nodes usually at the hilus. This combination of the primary focus and a corresponding lesion in the regional lymph nodes together with the interfocal zone connecting the two poles is known as the primary complex. With the establishment of the primary complex there occurs a change in the reaction of the body to the tubercle bacillus and its metabolic products. Allergy is established. As one of its significant manifestations the perifocal infiltration around the primary tuberculous lesion may become more intense. The size of this area and its fate depend largely on the number of tubercle bacilli and the amount of tuberculotoxins present and also in part on individual reactions, about which relatively little is known. The exudative perifocal reaction may ultimately be entirely resorbed. The primary focus may heal by fibrous encapsulation and calcification, or it may caseate and progress by contiguity and bronchogenic spread.

The bacilli travel from the primary focus along the lymphatics to the regional nodes. Usually there is no traffic problem; the bacilli are not so numerous nor are the roads so congested that unusual halts occur, and the bacilli next settle down in the nodes and form a secondary area of caseous tuberculosis, which may be small if there are few bacilli or which may reduce an entire node or group of nodes to a mass of caseous tuberculosis. Even when there is little local progression of the tuberculosis in the nodes, the tendency toward complete healing is not as great as in the primary focus, and it is not uncommon for caseation and living tubercle bacilli to persist in the nodes for long periods even though calcification is present.

Progression of the disease may occur by the bronchogenic route directly from the primary focus or more commonly from the rupture of a tuberculous node into a bronchus. The possibility of progression of the tuberculosis by the hematogenous route is always present, since in most cases at least a few bacilli will progress through the lymph channels to the blood stream. Whether this seeding of tubercle bacilli will result in tuberculous disease in the metastatic area involved depends largely on how many bacilli are implanted in any one area and whether the seeding is single or repeated. The anatomic structure and the position of the area involved also play a part. The spleen and the apexes of the lungs are regions most commonly seeded. Some organs are more resistant to tuberculous invasion than others, the thyroid and pancreas for

example, but this is only a relative immunity, as heavy seeding of these organs can occur leading to tuberculous disease. Any metastatic focus may progress and become an active tuberculous lesion, or it may regress and heal completely; living tubercle bacilli and caseation may exist for years in a quiescent focus of tuberculosis.

Generalized hematogenous tuberculosis usually results from invasion of a blood vessel by a caseating focus of tuberculosis or by dissemination from a tubercle within the lumen of the circulatory system. If a generalized seeding occurs the resulting lesion will depend largely on variations in three factors: the topographic location of the disseminating focus, the dosage and the frequency of seeding of tubercle bacilli. On the variations in these factors depend all the pictures of acute and chronic generalized hematogenous tuberculosis.

On the basis of this pathogenesis of tuberculosis the clinical picture seen in the child can be recognized and interpreted. The incubation period is the time between the first inhalation of tubercle bacilli and the development of a change in the reaction of the tissue to the tubercle bacillus and its metabolic products. It can be measured by the development of the tuberculin reaction, which usually becomes positive in three to five weeks after exposure. There is some evidence that the dosage of inhaled bacilli may affect the length of the incubation period and that with small dosage the tuberculin reaction may not become positive for four months.[1] Sometimes the development of the tuberculin reaction is delayed and the lesion appears on a roentgenogram before the reaction is positive.[2]

The only way in which one is privileged to see the clinical picture of the beginnings of tuberculosis in the human body is by watching the onset of the disease in children who have previously had negative tuberculin reactions (figs. 1 and 2). A child usually with a history of contact with a case of tuberculosis and with a previous negative reaction to a tuberculin test may have a fever with a temperature rarely over 102 F., lasting approximately three to ten days, with no other symptoms or signs, aside from the anorexia or languor which may accompany the fever and the first appearance of a positive reaction to tuberculin. Frequently the onset of fever coincides with a mild infection of the upper part of the respiratory tract. The roentgenograms may reveal a pulmonary lesion. Because of this insidious onset many of the cases are overlooked. Occasionally there is a stormy onset, with the signs and symptoms of pneumonia, including leukocytosis. The positive reaction to tuberculin, the persistence of the shadow on the roentgenogram after the crisis, when signs and symptoms have disappeared, and the character

1. Debré, R.; Páraf, J., and Dautrebande, L.: La periode antéallergique de la tuberculose, Ann. de méd. **9**:434 (June) 1921.

2. Levine, M. J.: Sequence of Roentgen Evidence of Tuberculosis and Cutaneous Sensitivity to Tuberculin, Am. J. Dis. Child. **58**:799 (Oct.) 1939.

of the roentgenographic shadow, with enlarged mediastinal ndoes as well as a parenchymal lesion, usually make clear the diagnosis of tuberculosis. It is possible that the type of onset is determined by the degree of tissue change or allergy. There seems to be no relation between the severity of symptoms at onset and the prognosis as regards length of activity of the disease or ultimate recovery.

After the onset it is often impossible to recognize early tuberculosis by signs and symptoms. It is usually suspected by a history of exposure to a patient with tuberculosis or by a positive reaction to a tuberculin test done as a routine procedure. A roentgenogram may then localize

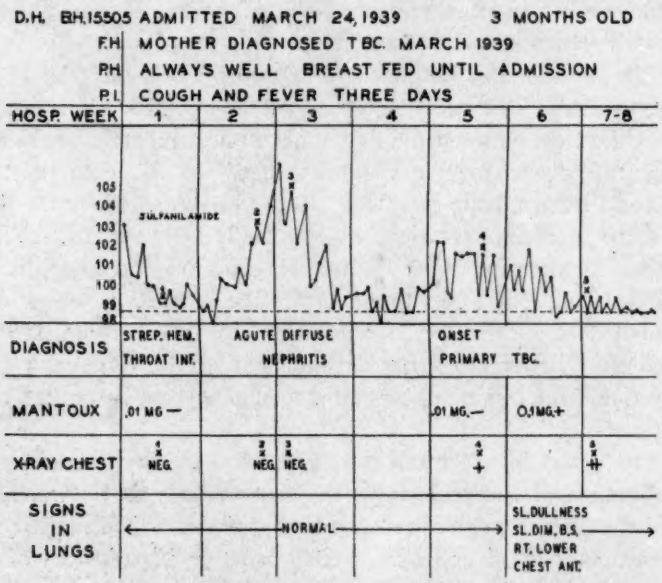

Fig. 1 (case 1).—Chart showing the onset of tuberculosis in an infant of 4 months who was exposed to a mother whose sputum was found to contain tubercle bacilli just before the baby's admission to the hospital. The incubation period was apparently about five weeks.

the lesion. By these three means most of the cases of tuberculosis in its early stages are found. Of 542 cases of first infection tuberculosis studied at Bellevue Hospital less than 10 per cent were discovered by physical examination because tuberculosis was suspected, and many of the cases recognized by clinical means were cases of tuberculous meningitis. More than 85 per cent of this group of cases were originally discovered by case-finding methods.

As a clinician, of course, one would like to be able to say that tuberculosis in its early stages can be recognized by the appearance of the child if not by his symptoms and physical signs. But it is usually

impossible to diagnose primary tuberculosis by looking at the child or by using the ordinary methods of physical diagnosis. There is no characteristic facies (fig. 3). How often has the clinical observation been verified that an infant doomed by tuberculous meningitis may be fat and rosy when the diagnosis is first made? Later in the course of tuberculosis, and especially when there is extensive bronchogenic spread or intestinal involvement, one may observe the listlessness and pallor, the long eyelashes and the general increase in body hair. When this

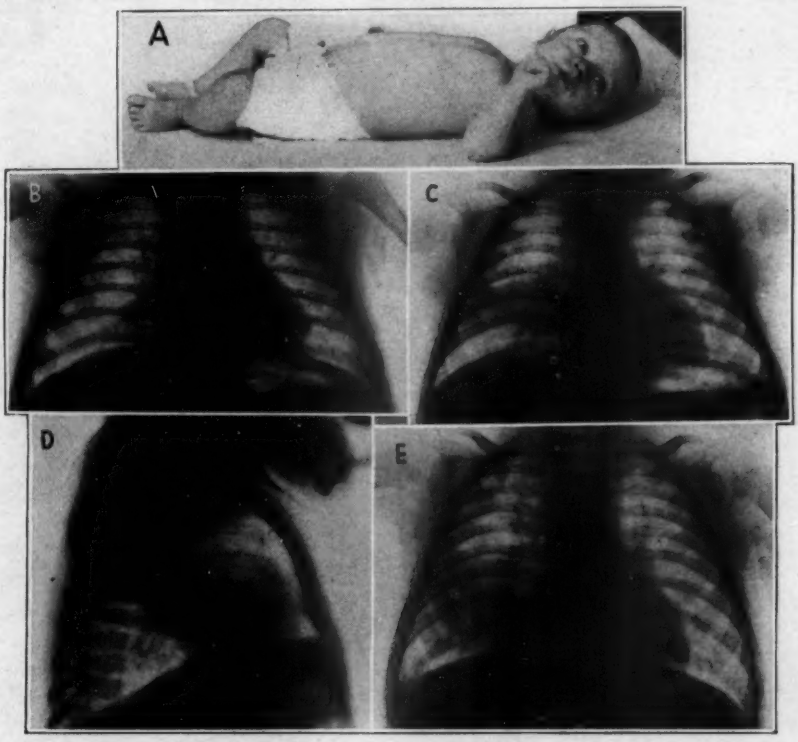

Fig. 2 (case 1).—*A*, photograph of infant three months after the onset of tuberculosis, showing the excellent state of nutrition. *B*, roentgenogram taken on April 5 (2 on chart) showing the essentially normal lung fields. *C*, roentgenogram taken on April 26 (4 on chart), showing the enlarged root of the right lung and a soft shadow extending downward and outward, interpreted as primary tuberculosis of parenchyma and nodes. *D*, lateral view places primary focus in the middle lobe of the right lung. *E*, roentgenogram taken at the time of the photograph in figure 1, showing persistence of the shadow in the right lung field.

picture of a chronically ill child is found, one also can usually detect symptoms and physical signs which obviously lead to a diagnosis of tuberculosis.

The usual case of primary tuberculosis gives no clinical clues to help in the diagnosis. Even with extensive parenchymal exudate the child rarely coughs; there is no expectoration, and when tubercle bacilli are demonstrated, it is by gastric lavage. Fever may be absent after the initial rise or there may be an occasional rise to 101 F. once or twice weekly, an irregular low grade fever. With extensive caseation in the mediastinum sometimes a daily rise in temperature to a high level is seen, but it is amazing how infrequently this type of fever is found even with marked disease. With intelligent parents one can often elicit a

Fig. 3 (case 2).—Photograph of a 3 year old girl showing excellent nutrition. She had a normal temperature and no abnormal physical signs. Tuberculosis was discovered by a routine Mantoux test. The mother was found to have tuberculosis.

history that the child seems to fatigue more easily than usual, but aside from this symptoms are usually lacking.

The paucity of abnormal physical signs in the early lesions of tuberculosis is also striking. There may be a large area of parenchymal involvement with normal physical signs or at most slight dulness or diminished breath sounds. Rarely bronchial breath sounds can be demonstrated, but moist rales are absent.

With the progression of the parenchymal lesion, signs of destruction of lung tissue are ultimately heard, and the resonant rale is the most characteristic sign. Constant rales, even if few, should always lead one to suspect bronchogenic spread.

Symptoms and signs due to encroachment of the enlarged nodes on bronchi and trachea present characteristic clinical pictures, the tuberculous nature of which is often overlooked. The mildest form, usually seen in children over 2 years of age, may be only unilateral bronchitis, which should always arouse suspicion of endobronchitis due to irritation by a mass of tuberculous nodes. With this syndrome there may be fever, and almost always there is a loose frequent cough. In infants the

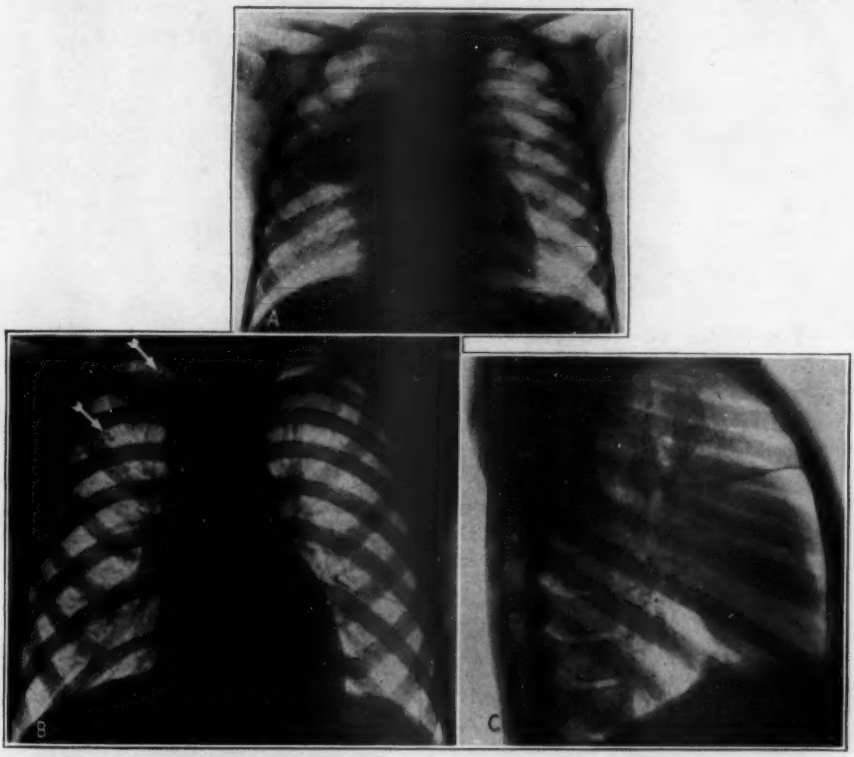

Fig. 4 (case 2).—*A*, roentgenogram taken when the child was 3 years old, interpreted as showing massive primary tuberculosis of the upper lobe of the right lung, with marked involvement of the nodes. *B*, roentgenogram taken six years later, showing small calcifications in the first right interspace and in the right apex. *C*, lateral view taken at the same time as *B*, showing large calcifying paratracheal nodes not visible in posteroanterior view.

cough is spasmodic with a suggestive whoop and often leads to an erroneous diagnosis of pertussis. Sometimes there is only a harsh, frequently repeated expiratory cough,[3] and often the diagnosis of large

3. Schick, B.: Expiratorisches Keuchen als Symptom der Lungendrüsentuberkulose im ersten Lebensjahre, Wien. klin. Wchnschr. **23**:153, 1910.

Fig. 5 (case 3).—Illustrations of change in nutritional state with progressive tuberculous disease. *A*, photograph of a 3 year old girl in the postprimary stage of first infection tuberculosis. Phlyctenular conjunctivitis is present, but no fever or abnormal signs in the chest. *B*, photograph taken five months later showing marked loss of weight and prominent abdomen. The roentgenogram of the chest was essentially unchanged, but many consonating rales were heard over the lower lobe of the right lung. Tuberculous peritonitis was present. Death occurred three weeks after the photograph was taken.

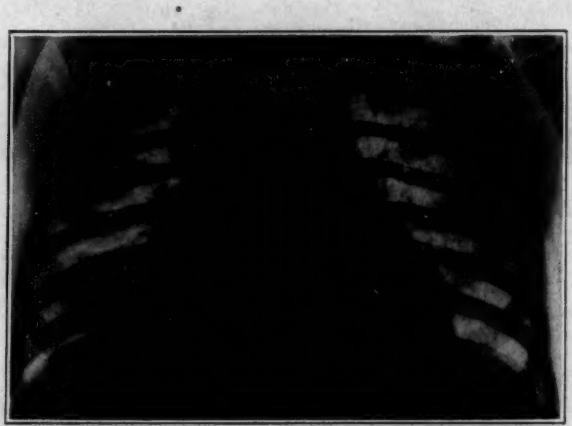

Fig. 6 (case 3).—Roentgenogram taken at the time of photograph *A* in figure 5, showing a large area of parenchymal tuberculosis in the lower lobe of the right lung with marked involvement of nodes.

mediastinal nodes is suggested by this symptom. Usually in infants rhonchi are heard throughout the chest. The diagnosis of asthma is not infrequently made. Sometimes the wheezing respirations suggest a foreign body. There may be complete obstruction of a bronchus causing a collapsed lobe, or with incomplete obstruction emphysema is often present. The diagnosis of compression of the bronchi may often be confirmed by the bronchoscope, which may reveal not only narrowing of the lumen but ulceration of the bronchial wall. If the enlargement of the nodes is due largely to perifocal reaction, the symptoms of bronchial obstruction may clear within a few days. More often the nodes are caseous, and it is weeks or months before the obstruction is relieved.

A rapid cessation of signs and symptoms of obstruction, especially when accompanied by a change in the character of the cough, should always lead to the suspicion that ulceration into a bronchus has occurred. Rarely large amounts of caseous material may be coughed up.[4] Sometimes the material can be aspirated by a bronchoscope.

If the node actually ruptures into the bronchus, the resulting clinical picture will depend on the dosage of tubercle bacilli and the amount of tuberculotoxins. Every grade of bronchogenic spread is seen, from bronchogenic miliary tuberculosis to massive caseous pneumonia. When the dosage of tubercle bacilli is low there may be no abnormal physical signs; with larger dosage physical signs of pneumonia may appear in a few days, but usually there are no constant signs for weeks.

Analogous symptoms due to pressure of tuberculous nodes may occur in the abdominal cavity when nodes encroach on the intestinal tract, causing partial obstruction and tremendous distention.

With progression of the primary tuberculous lesion by way of the blood stream there may be no symptoms or signs. But usually if a child with recent primary tuberculosis is carefully watched, within one to six weeks one can detect the clinical picture of what has been termed occult hematogenous tuberculosis,[5] which is really just part of the postprimary stage. Fever is usually absent, or there may be one or two rises in temperature to 101 or 102 F. Attention may be drawn to the child by the appearance of one or two phlyctenules. These are often fleeting and may disappear in twenty-four hours. A few papulonecrotic tuberculids may appear. The spleen at this time is often easily palpable or distinctly enlarged, and there is frequently a general enlargement of all the superficial lymph nodes. This picture of occult hematogenous spread usually lasts only a short while. It may have no clinical sequelae. In 2 per cent of

4. Scobie, R. B.: Acute Asphyxia from Intrabronchial Rupture of Tuberculous Mediastinal Gland with Recovery, Am. J. Dis. Child. **48**:393 (Aug.) 1934.

5. Lincoln, E. M.: Hematogenous Tuberculosis in Children, Am. J. Dis. Child. **50**:84 (July) 1935.

the cases in the Bellevue Hospital series apical calcifications were later seen on roentgenographic examination, as a result of this postprimary seeding. Because of this clinical course every child with a known recent primary infection, even if the roentgenogram is normal, should be carefully observed for three to six months. During this period any part of the body may show evidence of seeding of bacilli. There may be serous sympathetic meningitis, with the clinical picture of tuberculous meningitis, but with ultimate recovery, or transient red blood cells may be found in the urine owing to the development of a few tubercles in the pelvis of the kidney. With a larger dose of tubercule bacilli a frank metastasis, such as tuberculous dactylitis or tuberculous adenitis, may develop. It is usually in this postprimary period that tuberculous meningitis develops.[6] Of my cases of meningitis at Bellevue Hospital 85 per cent occurred within six months of the first diagnosis of tuberculosis. Usually the size of the original tuberculous lesion and especially of the node involvement bears a direct relation to the seriousness of complications. Meningitis can occur with a small primary infection or even with a normal roentgenogram, but this course of events is uncommon.

If generalized hematogenous tuberculosis occurs, the clinical picture is often easily recognized, although the differentiation between miliary and medium-sized lesions may be difficult without a roentgenogram. Protracted multiform hematogenous tuberculosis[7] is the result of repeated seedings of varying doses of tubercle bacilli, causing widespread tuberculous lesions of varying sizes. The clinical picture is striking. There is usually involvement of all the serous surfaces and of all the superficial lymph nodes, sometimes forming enormous masses which may obstruct lymphatic drainage. Not infrequently there is involvement of bones and joints as well. The roentgenogram usually shows rounded areas of density of varying sizes scattered through both lungs, but abnormal physical signs may be entirely absent until breaking down of these lesions occurs with bronchogenic spread.

The clinical pictures produced by the late evolution of tuberculous disease from metastases are the same in children and in adults. Chronic tuberculosis of the lungs is seen as well as chronic tuberculosis of the bones, lymph nodes and intestinal or genitourinary tract (figs. 7 and 8).

Most deaths from tuberculosis in children occur within a year of the onset of the disease and are usually due to metastases from the original

6. Rich, A. R., and McCordock, H. A.: The Pathogenesis of Tuberculous Meningitis, Bull. Johns Hopkins Hosp. **52**:5 (Jan.) 1933. Wallgren, A.: Some Aspects of Tuberculous Meningitis and the Possibility of Its Prevention, J. Pediat. **5**:291, 1934.

7. Grethmann, W.: Protracted Multiform Hematogenous Tuberculosis, Tr. Nat. Tuberc. A., 1936, p. 80.

focus. Nevertheless the child dies of tuberculosis as a direct result of the inhalation of tubercle bacilli, even though a complication is responsible for his death. If the child survives his first attack of tuberculosis and its complications, he may never have a recurrence of tuberculous disease, or after a quiescent period further tuberculous lesions may develop. Late manifestations of tuberculosis may occur at any age, but chronic tuberculosis of the lungs usually first manifests itself during the adolescent years, irrespective of the date of the primary infection.

It is possible to trace the origin of many lesions of chronic tuberculosis occurring in late childhood and in adolescence. Such lesions are usually due to the progression of metastases, either from the original

Fig. 7 (case 4).—Photograph of a 9 year old girl showing excellent nutrition. Large axillary masses are due to tuberculous nodes. The child had been in prolonged contact with a patient with open tuberculosis three years previously.

focus or from some secondary area of tuberculosis. If a hip joint has been previously seeded with tubercle bacilli, an injury may result in tuberculosis of the hip. A streptococcic infection of the throat may stir a few quiescent caseous foci in the cervical nodes into acute tuberculous adenitis. In an analogous way it is possible to postulate that some force about which little is known, glandular or chemical, acts in the adolescent girl to produce destructive tuberculous disease from old apical seedings.

As in other infectious diseases the prognosis of tuberculosis as regards life and complications seems to depend in large part on the severity of the attack. Just as it is better to have a mild attack of typhoid fever,

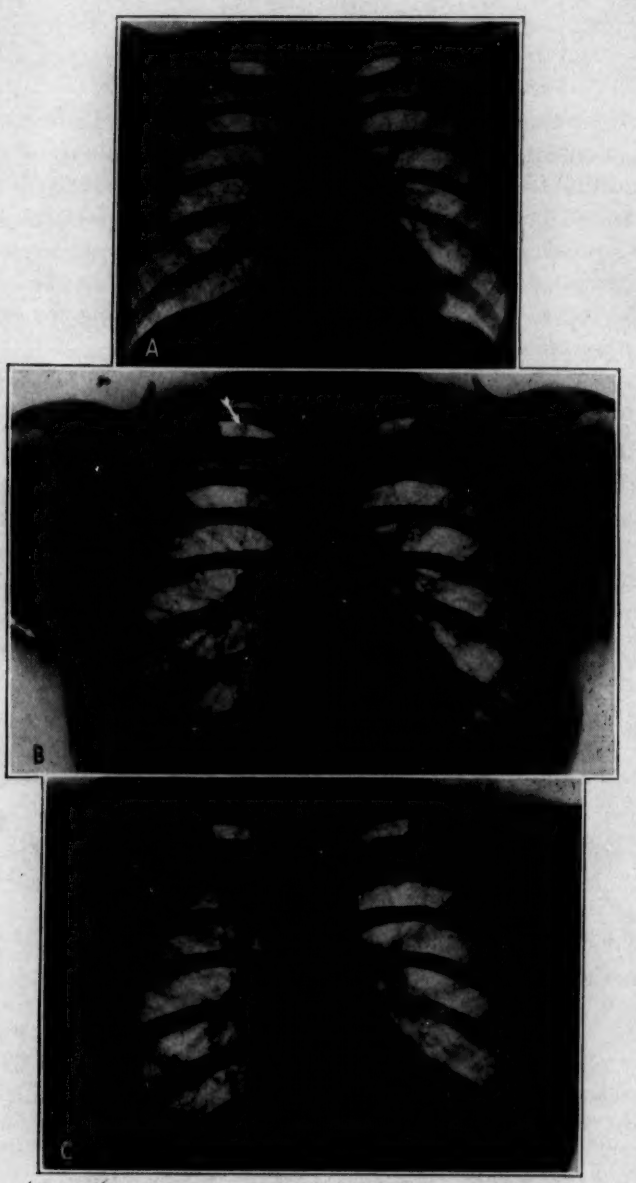

Fig. 8 (case 4).—Illustrations of late development of complications of tuberculosis. *A*, roentgenogram taken at the time of the photograph in figure 7 (1931), showing dense calcification behind the fourth right rib, with calcifications in the right bronchopulmonary nodes and calcifications in the second left interspace. Interpretation: well calcified primary tuberculosis with active disease in the axillary nodes, infected by the hematogenous route. *B*, roentgenogram taken seven years later (1938), showing, in addition to the findings in the roentgenogram of 1931, calcification of axillary nodes and a small area of density above the right clavicle containing calcium. *C*, roentgenogram taken in May 1939, showing infiltration in the second and third right interspaces, interpreted as indicating chronic pulmonary tuberculosis. The sputum contained tubercle bacilli. The patient received collapse therapy. No further contact with a patient with tuberculosis could be discovered. The condition is probably an example of endogenous chronic tuberculosis.

it is much better to have a mild attack of tuberculosis. A mild attack of typhoid has a better prognosis for life and much less danger of complications, although a hemorrhage or perforation occasionally occurs during an apparently light attack. Patients with mild tuberculosis have a better prognosis and less danger of serious metastases than those with conditions due to heavy dosage of tubercle bacilli, although occasionally a patient with a normal roentgenogram or a small lesion dies of meningitis. It is probable that this fact explains in part the great difference in statistics regarding prognosis which have been published from various parts of the United States. Brailey's [8] figures from Baltimore and the figures from Bellevue Hospital agree on the high mortality rate of children with tuberculosis. Of the group of 472 children with primary tuberculosis at Bellevue Hospital whom my associates and I were able to follow, 25.4 per cent died of tuberculosis within a year, although in 85 per cent of them the condition was first discovered by case-finding methods. Myers,[9] on the other hand, reported a mortality rate of 0.5 per cent in a group of 206 children with primary tuberculosis, of whom 155 were followed until the condition was healed. Possibly one explanation for the difference in mortality statistics may be the crowded living conditions in Baltimore and New York, giving the opportunity for prolonged and intimate contact with a patient with tuberculosis, which in turn may be responsible for a heavy dosage of tubercle bacilli and a progressive primary complex. Because of the great variations in statistics it is important to emphasize that data from different racial and social groups should not be applied indiscriminately. Results obtained in a midwestern city with a population of 500,000 may not apply to large urban centers, such as Baltimore and New York.

Great strides have been made in the prevention of tuberculosis in children by stressing the infectious nature of the disease. But tuberculosis in children is still a serious clinical problem. The most effective treatment in early stages, in order to reduce the immediate mortality from tuberculosis, is yet to be determined. How to prevent the later development of chronic pulmonary tuberculosis in those who survive the initial attack is not yet known. Possibly further study and analysis of the clinical pictures produced by first infection tuberculosis will help to solve these important problems.

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8. Brailey, M.: Mortality in Tuberculin-Positive Infants, Bull. Johns Hopkins Hosp. **59**:1 (July) 1936.

9. Myers, J. A.; Harrington, F. E.; Stewart, C. A., and Wolff, M.: First Infection Type Tuberculosis, Am. Rev. Tuberc. **32**:631 (Dec.) 1935.

Abstracts from Current Literature

Anatomy and Physiology

SUCROSE AND GLUCOSE TOLERANCE IN DEPANCREATIZED DOGS. P. O. GREELEY, D. B. TYLER and D. R. DRURY, Proc. Soc. Exper. Biol. & Med. **41**:36 (May) 1939.

More sucrose than dextrose was necessary to maintain a constant blood sugar level in depancreatized dogs after the same amounts of insulin, indicating a greater tolerance for sucrose than dextrose in dogs with the pancreas removed.

HANSEN, Minneapolis.

WIDTH, HEIGHT AND DEPTH OF PELVIS. H. YAMAMURA, Jap. J. Obst. & Gynec. **22**:273, 1939.

Measurements of 140 pelves from fetuses distributed equally over the last seven months of pregnancy and divided equally between males and females are given in great detail. Yamamura concludes that both width and depth are relatively greater in the fetus than in the adult and that the pelvis of the female is larger than that of the male fetus. The curvature of the iliac crest is less than in the adult, and the iliac alae are more vertical. ADAIR and POTTER, Chicago.

Biochemistry, Bacteriology, and Pathology

EFFECT OF ALCOHOL ON THE CHEMOTACTIC RESPONSE OF LEUKOCYTES. R. G. KLEPSER and W. J. NUNGESTER, J. Infect. Dis. **65**:196 (Sept.-Oct.) 1939.

The inflammatory response to pneumococcic infection was decreased in rabbits intoxicated with alcohol. Because leukocytes did not migrate into the zone of infection, changed vascular permeability was suggested. The effect of intoxication might, however, have been on the leukocytes, since the polymorphonuclear cells of deeply intoxicated rats lose their positive chemotaxis toward pneumococci. When alcohol is added to the white cells of human blood, they fail to be attracted to pneumococci. The average distance traversed by each cell in a given period of time is less in the alcoholic blood, and the cells are less motile. Rats chronically intoxicated became more susceptible to pneumococcic infections than the controls.

TOOMEY, Cleveland.

DIFFERENCE IN VIRULENCE OF VARIOUS TYPES OF PNEUMOCOCCI IN MICE. E. G. STILLMAN and R. Z. SCHULZ, J. Infect. Dis. **65**:246 (Nov.-Dec.) 1939.

As compared with strains of pneumococci of types II and III, freshly isolated strains of type I have low virulence for mice as measured by intraperitoneal injection and by inhalation.

Strains of type VIII have a high virulence when tested by intraperitoneal injection, but when they are sprayed on tissue surfaces their power of invasion is not marked.

TOOMEY, Cleveland.

PRESERVATION OF ST. LOUIS ENCEPHALITIS VIRUS. E. H. LENNETTE and M. G. SMITH, J. Infect. Dis. **65**:252 (Nov.-Dec.) 1939.

The virus of St. Louis encephalitis when dried in vacuo from the frozen state and stored at 4 C. retained its virulence for mice practically undiminished for seventeen months.

The infectivity of inoculated mouse brains was gradually lost when these were preserved in the form of a frozen tissue suspension, the titer falling from 10^{-6} to 10^{-2} after five months.

Fifty per cent glycerin–Locke's solution was found to be the most suitable of the glycerin menstruums for preserving the virus.

TOOMEY, Cleveland.

THERAPEUTIC PROPERTIES OF SULFANILAMIDE IN EXPERIMENTAL PNEUMOCOCCAL INFECTIONS. L. H. SCHMIDT and C. HILLES, J. Infect. Dis. **65**:273 (Nov.-Dec.) 1939.

Sulfanilamide showed marked therapeutic properties when administered to mice infected intraperitoneally with pneumococci of types I to XXXII. To obtain the maximum therapeutic response, it was necessary to administer 10 mg. of sulfanilamide as frequently as every six hours. Such treatment maintained a concentration of 8 to 12 mg. of free sulfanilamide per hundred cubic centimeters of blood. If mice were to be treated thus intensively, the initial therapy could be delayed for six to twelve hours after the pneumococci had invaded the blood without complete loss of the beneficial effects of therapy.

The effectiveness of sulfanilamide therapy varied with the type of pneumococcus used as the infecting agent. In infections with fourteen of the thirty types (I, V, VII, IX, XII, XIV, XVI, XVII, XIX, XXI, XXIII, XXV, XXVIII and XXXI) the drug had a high degree of curative action. In infections with 5 other types (X, XIII, XV, XVIII and XXXII) the drug had less curative action but markedly prolonged life. In infections with the remaining 11 types (II, III, IV, VIA and VIB, VIII, XI, XX, XXII, XXIV, XXVII and XXIX) the drug had no curative action but did prolong life. Possible explanations for these type variations have been discussed.

TOOMEY, Cleveland.

EFFECTS OF NEOARSPHENAMINE AND SULPHARSPHENAMINE ON EXPERIMENTAL FUSOSPIROCHETAL INFECTION IN GUINEA PIGS. T. ROSEBURY, G. FOLEY and F. L. RIGHTS, J. Infect. Dis. **65**:291 (Nov.-Dec.) 1939.

The topical application of neoarsphenamine and sulfarsphenamine in doses ranging from 6 to 18 mg. per kilogram of body weight is valuable in treating fusospirochetal infections of man when the therapeutic material is injected directly into the lesions. No evidence could be found to support the belief that intravenous or intramuscular administration of arsenicals is of any value in the treatment of these diseases.

TOOMEY, Cleveland.

A NEW METHOD OF CULTURING BACILLUS COLI. E. MESSERI, Riv. di clin. pediat. **37**:865 (Oct.) 1939.

The ammonium salt of alizarin is used as a basis for differential cultivation of the organisms of the Bacillus coli group. The medium—either broth or agar—is easily made, is stable in air and lasts for considerable time. It is practical for obtaining cultures of pathogenic organisms which are found in the stool, such as Bacillus dysenteriae, Bacillus typhosus and Bacillus paratyphosus.

HIGGINS, Boston.

Metabolism; Infant Feeding; Milk and Other Foods

OILS AS SUBSTITUTES FOR BUTTER FAT IN INFANT FEEDING. G. FRONTALI, J. Pediat. **14**:290 (March) 1939.

In the course of experiments carried on in 1921 to study the correlation of the various ingredients which would assure the best utilization of fats in cow's milk, Frontali demonstrated the fact that fats extracted from the stools have a higher

fusion point (above 41 C.) than those extracted from the corresponding foods. He concluded that the fats with the lower melting points are absorbed from the fatty mixture of the food and that those with the higher melting points are eliminated with the stools. The fats in human milk are utilized to a far greater extent than the fats in cow's milk. This is due to a difference in the fats found in both. Cow's milk contains 70 per cent palmitin and 30 per cent olein, whereas the reverse proportion is found in human milk. Frontali concluded that if the efficient utilization of the fat of human milk was due to the greater content of olein in the milk, improved retention of the fat of cow's milk could be obtained by increasing the proportion of olein. Substitution of a vegetable oil, such as olive oil, for the butter of cow's milk would accomplish this. Clinical studies on healthy infants and on infants with a diminished tolerance for fats have shown that feedings in which olive oil is substituted for butter fat permit an efficient utilization of fats, 96.26 per cent, which approaches the percentage of pure olein absorbed (97.77). The food is well tolerated and leads to regular and continuous gain in weight, while a similar food in which butter fat is used instead of olive oil, other circumstances being equal, gives inferior results.

RAUH, Cincinnati.

A REVIEW OF TWENTY YEARS OF BREAST FEEDING IN LIVERPOOL. M. ROBINSON, Arch. Dis. Childhood **14**:259 (Sept.) 1939.

At the infant welfare centers in Liverpool the case records for every fourth year over the period from 1918 to 1937 were investigated and comparative tables and graphs made in order to discover whether there had been any decline in breast feeding during that time. The records of one of the health visitor's districts for 1937 of patients who did not attend the clinic were reviewed to determine the breast-feeding rate as compared with that of patients who attended the clinic. No appreciable difference was found. One hundred family histories have been studied to discover whether heredity influences breast feeding, but no convincing evidence has been found to show that it does. On the other hand, there seems to be definite reason to believe that the influence of close relatives and of neighbours plays a considerable part in the maintenance of lactation. The incidence of breast feeding in mothers living in apartments has been compared with that among mothers occupying houses of their own. A further analysis shows that primiparas are much more easily influenced by neighbors and relatives than are multiparas.

KELLY, Milwaukee.

THE UDDER AS A POSSIBLE SOURCE OF COLIFORM ORGANISMS IN MILK. A. ROWLANDS, J. Hyg. **39**:454 (July) 1939.

Cow's milk is not infrequently infected with organisms of the edon type. This infection usually causes clinical symptoms of mastitis and stringy, curdly milk. Occasionally the milk is infected though no symptoms are present. When infection of the milk occurs an examination of udders for injury is advisable. The infection may be limited to a quarter of an udder or to a single teat. Examinations of the milk and of the cows for these organisms is important.

JANNEY, Wauwatosa, Wis.

FOOD OF PEASANT CHILDREN. V. MARCONI, Lattante **10**:381 (Sept.) 1939.

A census indicates that there are 5,390,000 rural homes in Italy. Of these, 142,298 are uninhabitable and should be demolished; 475,000 are habitable but in need of considerable repair; 930,000 are in need of slight repair, and the other 1,840,000 are habitable without repair. The economic conditions on farms supervised by the landlord or on farms owned by the farmers themselves are usually satisfactory. On the leased farms and on farms where the tenants work for half of the produce, economic conditions are poorer, and the nutrition of the peasants

is not so good. The diet of the peasants consists largely of cereal, milk for the small children, greens, rice, macaroni and small amounts of meat, sausage or dried codfish. The nutrition of the children seems to parallel the nutrition of the mothers; if the mother is malnourished the children are also poorly nourished. The mortality is high in this group.

The Italian authority for the safeguarding of public health faces a difficult problem in spreading basic hygienic knowledge to mothers in the rural districts.

HIGGINS, Boston.

VITAMIN C CONTENT OF INDIAN FIGS (OPUNTIA PHICUS INDICA). A. BRUNI, Med. inf., Rome **10**:274 (Sept.) 1939.

The composition of the Indian fig is: water, 77.6 per cent; protein, 0.8 per cent; fat, 0, and sugar 10.4 per cent. The calories number 250 per kilogram. Analyses for vitamin C showed between 0.34 and 0.50 mg. of ascorbic acid per gram of fruit. This indicates that figs are nearly as high as lemons (0.56) and oranges (0.60) and much higher than tomatoes (0.25) in content of vitamin C. The feeding of figs to guinea pigs on a scorbutic diet prevented scurvy from developing.

HIGGINS, Boston.

A NEW SOY BEAN FLOUR FOR INFANT FEEDING. G. BAYLEY BUSTAMENTE, An. Soc. puericultura de Buenos Aires **3**:187 (July-Sept.) 1937.

The composition of the new soy bean flour is as follows: protein, 42.75 per cent; fat, 22.50 per cent; carbohydrate, 14.73 per cent; cellulose, 2.35 per cent; mineral salts, 8.96 per cent, and water, 8.71 per cent. The fat consists of: oleic acid, 20 per cent; linoleic acid, 64 per cent; palmatic acid, 11 per cent, and stearic acid, 2 per cent.

HERRON, Oak Ridge, La.

HISTORY OF INFANT FEEDING. A. A. DE MUNOZ and M. ESCUDERO, An. Soc. de puericultura de Buenos Aires **3**:263 (Oct.-Dec.) 1937.

The authors review the literature on infant feeding from the contributions of Roderius de Castro of the seventeenth century to those of the present time. Only general features are discussed, no detailed formulas being given. Most of the material is gathered from the French literature.

HERRON, Oak Ridge, La.

CONDENSED MILK IN INFANT FEEDING. J. E. VIRASORO and F. JUSTO ROCA, An. Soc. de puericultura de Buenos Aires **3**:274 (Oct.-Dec.) 1937.

The making of condensed milk is discussed. The condensed milk used in this study is made in Argentina and after dilution consists of the following: fat, 2.84 per cent; lactose, 2.92 per cent; sucrose, 10.95 per cent, and protein, 2.58 per cent. It contains all of the vitamins in good proportion and is sterile. The authors have used the milk in the feeding of about 1,000 infants, not only the sick but the well, and have found it not lacking in either case.

HERRON, Oak Ridge, La.

Vitamins; Avitaminoses

A COMPARISON OF CEREAL AND NON-CEREAL DIETS IN THE PRODUCTION OF RICKETS. J. H. JONES, J. Nutrition **18**:507 (Nov.) 1939.

Jones presents data on the relation of the amount of calcium and available phosphorus in the diet to calcification in the rat. Rolled oats and wheat produced more calcification than did corn or either of the noncereal rations, namely, dextrinized corn starch and sucrose, when the calcium content of the diet was high (3 per cent calcium carbonate). The calcification on all cereal diets when the calcium

carbonate was 1 per cent was considerably increased; with noncereal foods there was no apparent increase with this calcium content.

FREDEEN, Kansas City, Mo.

DISTRIBUTION OF RIBOFLAVIN IN MEAT AND MEAT PRODUCTS. O. MICKELSEN, H. A. WAISMAN and C. A. ELVEHJEM, J. Nutrition **18**:517 (Nov.) 1939.

These Wisconsin investigators, by the use of a microbiologic method, determined the riboflavin content of various meat and meat products. Glandular tissues showed a higher content than muscular tissues. Stewing the meat apparently produced no loss of riboflavin; roasting or frying resulted in appreciable losses.

FREDEEN, Kansas City, Mo.

CHEMICAL ESTIMATION OF VITAMIN C, WITH ANALYSES MADE UPON SOME QUEENSLAND PRODUCTS. E. L. LEGGETT and K. W. ROBINSON, M. J. Australia **2**:241 (Aug. 12) 1939.

Leggett and Robinson describe the details of a modification of the method of Birch and co-workers for the determination of vitamin C. Figures are given for the vitamin C content of a number of Queensland fruits and vegetables. Tests carried out on the cooking of vegetables indicate a loss of 20 to 40 per cent of the vitamin C. Most of the loss occurs through solution in the cooking water. The deterioration of vitamin C in lettuce on storage is quite rapid—90 per cent destruction in seventy-two hours.

GONCE, Madison, Wis.

CONTENT OF VITAMIN A IN OLIVE OIL FROM THE PROVINCE OF SASSARI. G. CHIAROLINI, Riv. di clin. pediat. **37**:872 (Oct.) 1939.

In the extraction of olive oil in the province of Sassari in Sardinia, use is made either of the hot or of the cold process. As extraction with heat is more common, this product was used in the study reported. Young rats of about 50 Gm. each were put on a diet lacking in vitamin A. On the twentieth day of the diet they began to show vitamin deficiency in abnormal appearance of the skin, listlessness, anorexia and loss of weight; at that time olive oil was added to the diet in amounts varying from 0.05 to 0.5 Gm. per day. The animals died on the twenty-sixth to the twenty-eighth day of the diet, while control animals, not receiving olive oil, died on the twenty-third day. A second series of observations were made in which olive oil was added to the diet deficient in vitamin A from the beginning of the observations, the quantities used being the same as in the previous study. These animals showed a better gain in weight during the first twelve days of the observation; then they began to lose, and they died from twenty-two to twenty-three days after they were put on the diet, according to the amount of olive oil given. It is apparent from these observations that 0.5 Gm. of olive oil contains insufficient vitamin A to prevent or cure manifestations of vitamin A deficiency in the young rat.

HIGGINS, Boston.

VITAMIN C CONTENT IN VARIOUS SWEDISH PRESERVES MARKETED UNDER THE NAME OF "HAGEBUTTENSPEISEN." E. GEDDA and K. KJELLBERG, Ann. pædiat. **153**:104 (May) 1939.

Gedda and Kjellberg undertook investigations with simple routine methods in order to find some sources of vitamin C in ordinary daily food. They found that hops have great vitamin C value and deserve to be used more extensively in the household and that fresh hops made from the preceding year's harvest yield a soup with a much inferior ascorbic acid content. They have found, in addition, that the Swedish preserves sold under the names of *Hagebuttenmust* and *Hagebuttenkraft,* provided that they have been prepared recently, yield a soup of approximately

the same vitamin C content as one prepared from dried hops. The price of such preserves is naturally much higher. In conclusion they emphasized that:

1. The vitamin C value of freshly gathered hops should be made better known to the general public.

2. Even in their dried state hops are, in various preparations, a relatively good source of vitamin C (as a soup they can be compared with oranges).

3. The wrappers on the commercial preserves should indicate the method and date of preservation, the date of picking and how long the package can be kept without losing too much of its vitamin C value.

The authors add: Our new Swedish Institute of Public Health will find an important task in preparing a law dealing with these regulations.

FROM AUTHORS' SUMMARY.

QUANTITY OF CAROTINOIDS AND VITAMIN A IN BREAST MILK, ESPECIALLY WITH RESPECT TO ITS DEPENDENCY ON THE MOTHER'S DIET. C. FRIDERICHSEN and T. K. WITH, Ann. pædiat. **153**:113 (June) 1939.

Previous investigators of the content of vitamin A and carotinoid in mother's milk and cow's milk have almost exclusively analyzed isolated samples of milk from each subject, and this explains why the variations which the vitamin A and carotinoid content of the milk from the same subject undergo from day to day are not elucidated. Nor has the effect on the milk of the addition of vitamin A and carotinoid to the diet been studied thoroughly enough.

Friderichsen and With, employing a method which they describe in detail, examined the content of vitamin A and of carotinoid in the milk from 5 nursing women. The diet of these women contained from about 2,350 to about 3,975 international (U. S. P. XI) units of vitamin A plus 1,720 international (U. S. P. XI) units of vitamin A–active carotinoid per day (the limits corresponding to winter and summer diet). The determinations were made every day or every second or third day for periods of from one to three weeks during different seasons. From the results of the examinations they derived the following conclusions:

1. The content of vitamin A and of carotinoid in mother's milk undergoes considerable variation from day to day (± 25 per cent or more).

2. The variation does not run parallel with the fat content of the milk.

3. If the diet is sufficient with regard to vitamin A, the content of vitamin A and of carotinoid in mother's milk presents no difference as between winter and summer, though now and again fairly great variation independent of diet and season may occur.

4. After peroral administration of carotene an increase of the serum carotene was observed, but no increase of the content of vitamin A and of carotinoid in the milk.

5. The diet which the nursing woman receives (about 75 international [U. S. P. XI] units per kilogram of body weight per day) is not only sufficient but as regards vitamin A is even optimal.

6. If the diet is sufficient, the administration of vitamin A preparations during lactation is superfluous.

FROM AUTHORS' SUMMARY.

SHOCK TREATMENT OF RICKETS AND SPASMOPHILIA WITH THREE MILLIGRAMS OF VITAMIN D_2 AND D_3. H. BRIEGER, Monatschr. f. Kinderh. **79**:216 (Aug.) 1939.

The studies were made during the winter season on 29 infants with rickets and spasmophilia. In infants with rickets in the second stage the bony changes healed clinically and roentgenologically by the eighteenth day following the use of both vitamin D_2 and D_3. The calcium-phosphorus determinations reached normal between the twelfth and sixteenth days on vitamin D_2 and between the eighth and twelfth days on vitamin D_3.

The 3 mg. dose did not cure rickets in 2 premature infants.

In infants with spasmophilia the nervous irritability diminished on the fourth or fifth day with vitamin D_2 and on the second or third day with vitamin D_3. The associated bone change healed in ten to twelve days on vitamin D_2 and in seven days on vitamin D_3.

In all cases, intercurrent infections delayed healing. GERSTLEY, Chicago.

Hygiene; Growth and Nutrition; Public Health

ESTIMATION OF PHYSIQUE AND NUTRITION IN CHILDREN. A. W. TUXFORD, J. Hyg. **39**:203 (March) 1939.

This article includes an extensive and detailed study of weights and measurements of children in England compiled during the last thirty years. The statistics were computed from a study of 583,640 children of both urban and suburban districts. Graphs were plotted for rates of growth in both weight and height and included children from 4 to 14 years of age. Children in rural areas and in southern England were physically superior to the urban groups, environment being an important influence. There is little difference in the annual addition to height at the beginning and at the end of school life. Weight was gained in a more variable manner, varying from 6.3 to 13.2 per cent per annum. It was concluded that nutrition is not a static condition, and that the intensity of the process is probably not static in any child. Factors affecting health, such as the functional condition of all the organic structures of the body or infections, may entirely neutralize the effects of the nutritional process.

JANNEY, Wauwautosa, Wis.

NATIONAL PROGRAM FOR THE PROTECTION OF MOTHERS AND CHILDREN IN THE PAST, THE PRESENT AND THE FUTURE. M. ORTOLANI, Lattante **10**:449 (Nov.) 1939.

If Italy is to advance from being seventeenth among the 28 more progressive countries in the matter of infant mortality, the national program for the improvement of nutritional and medical care of children must be perfected and coordinated.

HIGGINS, Boston.

OBSERVATIONS ON EPIDEMICS IN DAY NURSERIES. F. PONTIERI, Pediatria **47**:402 (May) 1939.

Day nurseries (*asili-nidi*) have been established in cities of Italy for the care of children whose mothers must work during the day. Here the children are under the care of doctors and are fed in the best possible manner known to medicine. The children are also protected from the infections to which they were previously exposed when they were entrusted to unqualified and untrained persons. Children up to 3 years of age are taken. Two hundred children have been observed; 30 per cent contracted measles, 27 per cent pertussis and 48 per cent chickenpox. Diphtheria occurred in 4. None with scarlatina were observed.

MARTOCCIO, UTICA, N. Y.

DISORDERS OF GROWTH AND DEVELOPMENT. RICHARD WAGNER, Wien. klin. Wchnschr. **49**:628 (May 15) 1936.

Wagner proposes the following scheme of classification for disorders of growth and development:

I. Disturbances of internal origin:

1. True infantilism from constitutional causes, including temporary disorders during the developmental period
2. Endocrine disturbances: (*a*) eunuchoidism, (*b*) hypothyroidism, (*c*) hypopituitarism, (*d*) precocious puberty (endocrine form)

3. Precocious puberty (nonendocrine form)
4. Primordial dwarfism
5. Mongoloid and other symptom complexes, with multiple degeneration
6. Chondrodystrophy and osteogenesis imperfecta

II. Disorders of external origin:

1. General causes: (*a*) premature birth, (*b*) inadequate diet or nutritional disorders, (*c*) chronic infectious disease
2. Disorders in different organs: (*a*) cardiac infantilism, (*b*) intestinal infantilism, (*c*) hepatic infantilism, (*d*) insulin infantilism, (*e*) renal infantilism

This scheme is not complete, as the author readily admits. Growth and development are not sharply differentiated. Precocious puberty is included because it sometimes leads to early cessation of growth after an initial acceleration.

Among the temporary disorders of development, according to Rosenstern, are disturbances of: (1) fat deposition, (2) muscular development, (3) skeletal growth (longitudinally or laterally) and (4) combined forms. Deficiencies in skeletal growth may be investigated by roentgen rays. Temporary dwarfism is usually undifferentiated; the chronic type is completely differentiated. Wagner recommends a policy of watchful waiting in the treatment of these disorders. Often glandular preparations are administered and credited with a result which would have taken place naturally even if they had not been given. ABT, Chicago.

NEW TRENDS IN SOCIAL PEDIATRICS. A. BRINCHMANN, Acta pædiat. **24**:301, 1939.

Cognizance is taken of a growing tendency to divide the care of the child between the pediatrician and the psychologist; it is urged that the physician prepare himself to play both roles in a capable manner. MCCUNE, New York.

RHYTHM OF GROWTH, DEVELOPMENT AND RESISTANCE; VARIABILITY AND TEMPERAMENT. O. VAN ANDEL-RIPKE, Nederl. tijdschr. v. geneesk. **83**:3194 (June 24) 1939.

By biologic study of the child one is enabled to establish standards of growth and to get an insight into the general rules of development which define for each phase of life the criteria of good health. A certain rhythm is found in the growth process. The periods of intense metabolism are phases of diminished physical resistance, in which external factors easily lead to deformities or derangements. They are followed by periods of natural imbalance (negative phase), so that an interference of mental and physical periods can be spoken of. The division into temperamental types is important for a correct view of vital properties, all of which during the individual process of development are more or less prone to deviations and are comparable only in children of the same type. These differences are innate and organically defined (by metabolism). By a study of the general process of development and temperamental variability, one can observe several human properties in their genesis and thereby obtain rational indications for both the interpretation and the management of symptoms presented as a sequel of development or as disease. VAN CREVELD, Amsterdam, Netherlands.

Prematurity and Congenital Deformities

THREE-PHALANGEAL THUMBS. S. L. HAAS, Am. J. Roentgenol. **42**:677 (Nov.) 1939.

Haas states that only a few cases have been reported but that the occurrence of thumbs with three phalanges is not so uncommon. The histories of three families are given in which one or more persons had three-phalangeal thumbs, with three joints. The findings suggest that in the normal developing thumb the extra phalanx is assimilated by the distal phalanx. In several patients there was a

duck bill appearance of the end phalanx, a separation of the extra phalanx and other evidence of attempts at division. In explanation of the anomaly of the three-phalangeal thumb it may be said that it represents an arrested attempt to form an extra thumb, because of the tendency to bifurcation of the end phalanx in several cases and the finding of an extra phalanx in a six-fingered person who had also a duck bill distal phalanx and a dichotomous proximal phalanx.

SQUIRE, Chicago.

INTERDEPENDENCE OF A PUBLIC CHILD HEALTH PROGRAM TO THE PRACTICE OF OBSTETRICS AND PEDIATRICS. E. B. BALL, Illinois M. J. **76**:265 (Sept.) 1939.

In this comprehensive article Dr. Ball recites the needs for a child health program in the state of Illinois. The program carried out by the state department of health during the twenty years previous to 1936 is outlined. The essayist then enumerates the activities of the state department of health since funds for maternal and child health services became available under the Social Security Act in 1936. In this new federal program, Dr. Ball states, the state department of health has met with the wholehearted cooperation of the county medical societies, the obstetrician and the Academy of Pediatrics.

BARBOUR, Peoria, Ill.

INIENCEPHALUS. J. HOWKINS and R. S. LAWRIE, J. Obst. & Gynaec. Brit. Emp. **46**:25 (Feb.) 1939.

Howkins and Lawrie divide the condition into two types, iniencephalus apertus and clausus. They call attention to the frequency with which hydramnios is associated with iniencephalus apertus and consider it of fetal origin. Antenatal roentgenographic examination is urged in the diagnosis of iniencephalus apertus. The morbid anatomic features are in general extreme retroflexion of the head, with shortening or absence of the neck, and a deficient cranial vault. There is usually compression of the cervical and thoracic vertebrae in lordosis. It may also be associated with other abnormalities, as myelocele, spina bifida or umbilical hernia.

POTTER, Chicago.

THE HEALTH OF THE FETUS OR TRUE NATIONAL INSURANCE: A REVIEW OF CERTAIN ASPECTS OF FETAL ENVIRONMENT. R. FOWLER, M. J. Australia **2**:155 (July 29) 1939.

In a study of stillbirths and neonatal deaths in Australia the commonest causes were found to be (*a*) prenatal interference with exchange of metabolites, of which the commonest type is fetal anoxemia; (*b*) injury at birth; (*c*) prematurity; (*d*) fetal infections, and (*e*) congenital malformations. Wasting diseases and avitaminoses are not uncommon in the newborn. The studies indicate that maternal diet, particularly the intake of milk, is extremely important in safeguarding the fetus against these conditions.

TENNEY, Madison, Wis.

CONGENITAL DEFECT OF THE STERNUM. C. G. H. BRINK, South African M. J. **13**: 606 (Aug. 26) 1939.

A case report of a 7 year old child who had complete absence of the sternum is presented.

GONCE JR., Madison, Wis.

FATE OF PREMATURE INFANTS. K. W. SCHULTZE, Ztschr. f. Geburtsh. u. Gynäk. **118**:405, 1939.

Of 683 premature infants born in Schultze's clinic during a five year period, 15.6 per cent were stillborn and only 55.9 per cent left the clinic alive. Investigation of 160 of these children after periods of from eight to thirteen years, by physical examinations of 97 and questionnaires on 63, showed no fundamental difference between them and their brothers and sisters in height, weight and

general development. Forty per cent of the premature children and an equal percentage of their brothers and sisters were physically and mentally below average. Four and eight-tenths per cent of the children born prematurely showed organic cerebral involvement.

Schultze discusses extensively the importance of premature birth from the standpoint of demography and public health. ADAIR and POTTER, Chicago.

BILATERAL APLASIA OF THE UPPER EXTREMITIES (BRACHIAL AMELIA). E. REDENZ, Ztschr. f. Geburtsh. u. Gynäk. **118**:442, 1939.

A macerated stillborn fetus is described in which the scapula and clavicle were normal but in which no vestige of either arm was present. The remainder of the body was normal.

ADAIR and POTTER, Chicago.

MALFORMATIONS OF THE EXTREMITIES RESULTING FROM OLIGOHYDRAMNIOS. M. MOLITOR, Ztschr. f. Geburtsh. u. Gynäk. **118**:447, 1939.

Molitor reviews the literature and gives 12 case histories of women with oligohydramnios during pregnancy, each of whom delivered a child suffering from a deformity. The most common abnormality was clubfoot. Associated anomalies were torticollis, polydactylism, syndactylism, and mongolism. An attempt is made to establish oligohydramnios as a cause of increased pressure. This results in mechanical production of the deformities. The author admits that congenital defects of germ plasm may also be contributing factors.

ADAIR and POTTER, Chicago.

A CASE OF THORACOPAGUS WITH BILOCULAR HEART. G. ILBERG, Ztschr. f. Geburtsh. u. Gynäk. **119**:369, 1939.

Ilberg describes fetal triplets in which one fetus was normally formed, while the other two formed a thoracopagus. The anatomic relationships of the organs in such a case are discussed, and cases which have been observed by other investigators are cited.

ADAIR and POTTER, Chicago.

A RARE DEFORMITY OF THE FOREARMS. J. KOPITS, Orvosi hetil. **83**:53 (Jan. 21) 1939.

In a girl aged 6 years there was a marked deformity of both forearms. The radius was strongly curved, and the hand was distorted in the ulnar direction. The fourth and fifth fingers of the right hand could not be straightened out. Kopits believes that the distortion was caused by rickets and calls it radius curvus.

GÖTTCHE, Budapest, Hungary.

ANEMIA IN PREMATURE INFANTS. A. WALLGREN, Acta pædiat. **24**:50, 1939.

Although conceding freely the importance of endogenous factors in the genesis of anemia in premature infants, Wallgren lays especial emphasis on environmental hazards: these, he claims, play a much more important role in overtaxing the blood-forming capacity of premature infants than is commonly recognized.

McCUNE, New York.

BONE MARROW OF INFANTS BORN BEFORE TERM. A. LICHTENSTEIN and W. G. NORDENSON, Acta pædiat. **24**:57, 1939.

The subjects studied were 8 full term and 26 premature infants. Specimens of marrow were obtained successively during the first year of life by puncture of the tibia. In conjunction with each examination of marrow stained smears of the peripheral blood were studied. During the first three months after birth the marrow of the premature infants remained hyperplastic and immature; these

features were mirrored with surprising fidelity in the peripheral blood. Evidence of incipient maturity appeared decisively at the third month, although the marrow did not become entirely normal until the beginning of the second year. These observations are taken to confirm Lichtenstein's long-held hypothesis that the anemia of premature infants is due to temporary functional insufficiency of the bone marrow.

McCune, New York.

Newborn

Anemia of Newborn. J. Calder, Canad. M. A. J. **41**:484 (Nov.) 1939.

Calder reviews briefly the subject of anemia in the newborn and reports on the blood findings in 10 cases.

Transfusions were found to be valuable in treatment. An important point was noted in giving transfusions: that it is sometimes wise to change donors, as different blood seems to have different stimulative powers. Liver extract is of doubtful value.

Moore, Omaha.

Tetany in Newborn Infants: Relation to Physiologic Hypoparathyroidism. H. Bakwin, J. Pediat. **14**:1 (Jan.) 1939.

Twenty-seven authentic cases of tetany of the newborn have been reported up to the present. Bakwin believes that temporary hypofunction of the parathyroid glands is the underlying cause of this condition and cites in proof three observations on newborn infants: (1) an abrupt drop in serum calcium within a few hours after birth, (2) a reduction in the urinary excretion of phosphorus and (3) an exaggerated response (a greater reduction than normal) of the serum calcium to ingestion of phosphate.

That vitamin D plays no part in the development of tetany of the newborn is indicated (1) by the failure of vitamin D to modify significantly the drop in the serum calcium after the oral ingestion of phosphate and, (2) by the fact that calcium produces a cure in tetany of the newborn, whereas it has only a temporary, palliative effect in the vitamin D deficiency of older infants.

A second factor leading to tetany of the newborn is phosphate, either released endogenously during the neonatal physiologic period of starvation or, more probably, ingested in cow's milk. Though the mechanism by which phosphate leads to hypocalcemia is not clear, the most plausible explanation seems to be that phosphate removes calcium from the fluids of the body by combining with it to form insoluble salts in the lower part of the intestinal tract, thereby preventing the reabsorption of calcium.

Rauh, Cincinnati.

Artificially Induced Premature Birth and the Triad Icterus Gravis Familiaris, Congenital Anemia and Hydrops Congenitus Universalis. C. deLange, Ann. pædiat. **152**:277 (Feb.) 1939.

DeLange communicates clinical data and histologic observations on a child born with icterus gravis familiaris after premature induction of labor. On account of the present study and a previous one on a premature baby born after eight months of pregnancy, she is of the opinion that the induction of premature labor is not associated with the triad of icterus gravis (icterus, erythroblastosis, hydrops congenitus).

From Author's Summary.

Relation of the Size of Twins to the Length of Pregnancy. F. Stehle, Ztschr. f. Geburtsh. u. Gynäk. **118**:159, 1939.

During a twenty-five year period at the Freiburg Frauenklinic 310 pairs of twins were delivered, an incidence of 1 double pregnancy to 94 single pregnancies. Numerous tables are presented showing the relationship of weight, length and period of gestation. The conclusion is reached that twins are less mature than

are single infants of corresponding periods of gestation and that they exhibit greater variation from the average measurements of infants than do single infants.

ADAIR and POTTER, Chicago.

RARER CAUSES OF THE MORTALITY OF THE NEWBORN. B. SCENDI, Ztschr. f. Geburtsh. u. Gynäk. **118**:420, 1939.

Scendi discusses three unusual causes of death in newly born infants and describes 6 infants with congenital goiter, 3 with thymic hypertrophy and 4 with left-sided diaphragmatic hernia.

ADAIR and POTTER, Chicago.

CAPILLARY PERMEABILITY OF THE INTESTINE IN THE NEWBORN AND THE EFFECT OF VITAMIN C ON MELENA NEONATORUM. H. WINKLER, Ztschr. f. Geburtsh. u. Gynäk. **119**:195, 1939.

Occult blood was present on the first day of life in 48 per cent of the stool specimens of 50 newborn infants examined during the summer, compared with 67 per cent for the same number examined in the winter. Evidence of blood disappeared before the tenth day in the summer and was still present at that time in 16 per cent in the winter. Administration of ascorbic acid to the infants caused an increase in the number without blood in their stool in winter and produced no change in summer. Ripe citrus fruit used as a source of vitamin C is superior to the synthetic compound, since it contains factor P, an additional valuable substance.

ADAIR and POTTER, Chicago.

ICTERUS GRAVIS. H. BOEHNCKE, Ztschr. f. Kinderh. **60**:666 (April 1) 1939.

Until recently the following features were considered characteristic of icterus gravis: early (sometimes congenital) icterus, bilirubinuria, hepatosplenomegaly, anemia with erythroblastosis and immaturity of white cells, a serious clinical condition often characterized by cerebral symptoms and, usually, a lethal termination. Autopsy reveals widespread deposits of pigment and extramedullary blood-forming areas as well as nuclear icterus. Two outstanding characteristics of the disease are (1) familial occurrence and (2) relation to congenital hydrops and congenital anemia. Recent reports have shown that erythroblastosis and nuclear icterus are not specific manifestations of icterus gravis, congenital hydrops or congenital anemia. The assumption that erythroblastosis is a reaction to anemia is not always tenable, for erythroblastosis may precede anemia or may be absent.

The author reports 10 cases, in 7 of which the conditions observed were characteristic of icterus gravis. In 2 cases in which numerous transfusions were given, there was a transition to an anemic condition corresponding to congenital anemia, and the patient recovered. The value of transfusion is stressed. Ross and Waugh advocate transfusion for hemolytic icterus but advise against this therapy for biliary stasis because of the danger of increasing bilirubinemia and consequently producing convulsions and hemorrhagic diathesis. On the basis of the reports of other authors and on that of his own experience with 1 case, Boehncke discusses the apparent prophylactic value of liver therapy during pregnancy.

SIEMSEN, Chicago.

LENGTH OF THE ESOPHAGUS IN THE NEWBORN. T. ONISHI, Acta pædiat. japon. **45**:871 (June) 1939.

The length of the esophagus from the gingival edge to the gastric cardia in the newly born infant was measured by means of roentgenography. It has been found that irrespective of the months of gestation there is a direct relation between the total body length and the length of the esophagus, and the length of the esophagus may be calculated from any one of the following formulas: body length $\times$ 0.2 + 6 (cm.); or sitting height $\times$ 0.4 + 3.5 (cm.); or sternal length + 9 (cm.).

KATO, Chicago.

FACIAL PARALYSIS IN THE NEWBORN. E. HAUCH and M. OTTSEN, Acta obst. et gynec. Scandinav. **19**:345, 1939.

Eight cases of facial paralysis in the newborn are reported, in 7 of which it involved one side of the face and in 1 both sides. Abnormal pressure on the child during delivery plays a role in the production of this paralysis, but the exact cause usually cannot be ascertained. The prognosis is good.

ADAIR and POTTER, Chicago.

PROPHYLACTIC AND CURATIVE EFFECT OF VITAMIN K IN HEMORRHAGIC DISEASE OF THE NEWBORN (HYPOTHROMBINEMIA HAEMORRHAGICA NEONATORUM). K. K. NYGAARD, Acta obst. et gynec. Scandinav. **19**:361, 1939.

Prothrombin appears to be normal at the time of birth, but physiologic hypothrombinemia develops and is present from the second half of the first day to the sixth day. The onset of hemorrhagic disease usually occurs during this interval, and in infants showing evidence of hemorrhage hypothrombinemia is more marked than is characteristic for this stage of life. The development of physiologic hypothrombinemia appears to be prevented by administration of vitamin K immediately after delivery. When vitamin K was administered to 3 infants with hemorrhagic disease, it gave a therapeutic effect equal to that of blood transfusion.

ADAIR and POTTER, Chicago.

CITRIC ACID CONTENT OF THE BLOOD IN TRANSITORY HEMOPHILIA OF THE NEWBORN. L. SALMONSEN, Acta pædiat. **24**:36, 1939.

Citric acid is demonstrable in all body fluids, being present in abundance in milk, urine and sperm and in low concentration in the blood serum. Determined by the Thunberg methylene blue method, the concentration varies from 300 to 1,300 mg. in a liter of milk and from 18 to 28 mg. in a liter of serum. Recent Swedish investigations have shown that the serum citric acid of the mother increases rapidly after delivery, then declines abruptly, synchronous with an increase in the excretion of citric acid in the breast milk. The highest concentration of citric acid in the breast milk is reached at the time when hemorrhagic disease of the newborn usually makes its appearance.

Determinations of the concentration of citric acid in the serum of 18 healthy newborn infants yielded values that varied between 16.5 and 23.7 mg. per liter. In a given infant the value remained relatively constant during the first few weeks of life. Seventeen analyses in 8 cases of hemorrhagic disease of the newly born revealed the following: normal values in 1 case, a slight decrease of concentration in 2 cases; in 5 cases a marked decrease and in 1 case a decrease to a value of 4.6 mg. per liter. The concentration of citric acid in the serum could not be shown to be closely correlated with other hematologic findings, although it was clear that the cessation of bleeding coincided with the return of the serum citric acid to normal. Salmonsen examined the breast milk of the mothers in 3 of the 8 cases and in 2 others, and found that it contained normal amounts of citric acid. Efforts to check the bleeding by parenteral administration of sodium citrate resulted in failure. An explanation of the significance of the phenomenon is not supplied.

McCUNE, New York.

Acute Contagious Diseases

PARALYSIS OF DEGLUTITION AND RESPIRATORY FAILURE IN ACUTE ANTERIOR POLIOMYELITIS. L. A. MILLER, Arch. Pediat. **56**:339 (June) 1939.

The important and interesting feature of the case reported was that the function of deglutition was the first to show evidence of paralysis and the last to be restored. Recovery did not occur until the eighty-sixth day.

The Drinker respirator was ideally efficient in treatment in this case and undoubtedly saved the life of the patient.

ORR, Buffalo.

SULFAPYRIDINE AND EXPERIMENTAL POLIOMYELITIS. J. A. TOOMEY and W. A. TAKACS, Arch. Pediat. **56**:384 (June) 1939.

Under general ether anesthesia, 8 Macacus rhesus monkeys, weighing from 3 to 5 pounds (1.3 to 2.3 Kg.), were each given intracerebrally 0.5 cc. of a 1 per cent suspension of purified poliomyelitis virus, Flexner's M. V. strain. Two days later 4 of the animals each received 0.5 Gm. of powdered sulfapyridine (2-[paraaminobenzenesulfonamido]-pyridine) twice daily for from seven to ten days, when massive paralysis appeared. The sulfapyridine level in the bloods of these animals varied from 1.2 to 8.2 mg. per hundred cubic centimeters.

It may be concluded that sulfapyridine is of no value in preventing experimental poliomyelitis in monkeys of this species.

ORR, Buffalo.

PRESENT STATUS OF DIPHTHERIA AND TETANUS TOXOIDS. O. L. CANON, Arch. Pediat. **56**:409 (July) 1939.

The immunity derived from one dose of alum-precipitated diphtheria toxoid is inferior to that obtained with two doses of alum-precipitated toxoid or three doses of plain toxoid.

As the basic immunity produced by tetanus toxoid is desirable, combined diphtheria and tetanus toxoid should be given in two doses routinely in the practice of pediatrics.

ORR, Buffalo.

PROPHYLACTIC VACCINATION AGAINST WHOOPING COUGH. J. H. LAPIN, P. COHEN and M. WEICHSEL, Arch. Pediat. **56**:590 (Sept.) 1939.

By means of complement fixation tests, the antigenic value of Sauer's pertussis vaccine is compared with that of a toxin vaccine prepared by Mishulow of the department of health of the city of New York. Sauer's vaccine produced a less marked and less prolonged complement fixation than Mishulow's vaccine. With the latter, considerable response in complement-fixing antibodies occurred one week after the first injection and a maximal response one week after the last injection of 80,000,000 pertussis bacilli administered in three weekly doses. In most instances the serums still gave positive reactions four weeks after the last injection. Four months after vaccination most of them gave negative results.

A control series of unvaccinated children was included in the study to determine the clinical effectiveness of the vaccines in the prevention and modification of whooping cough. The incidence of the disease in the three groups is described in the following table.

	Clinic Patients Number of Patients per Group	Patients in Whom Pertussis Has Developed	Rate of Attack in Percentage
Sauer vaccine	180	5	2.8
Department of health vaccine	165	3	1.8
Controls	46	4	8.7
	Private Patients		
Inoculated	144	8	5.6
Controls	122	62	50.8

When the disease occurred in the vaccinated group, it was milder than when it occurred in the controls.

The authors suggest that it might be advantageous to space the inoculations over a longer period and that the dose should be increased for children above the age of infancy.

ORR, Buffalo.

USE OF SPECIFIC VACCINE IN THE PREVENTION AND TREATMENT OF PERTUSSIS. F. S. LANSDOWN, Arch. Pediat. **56**:655 (Oct.) 1939.

The literature on pertussis vaccine has been reviewed extensively from the point of view of technic of preparation and administration and of the use of the vaccine for treatment, prophylaxis and the production of immunity. The

phase 1 vaccines in use today are apparently effective in that they at least reduce the chances of contracting whooping cough when administered four months or more before exposure. There has not been sufficient controlled investigation to show whether the vaccine is of value as a therapeutic agent. ORR, Buffalo.

EXPERIENCE WITH A RAPID CLINICAL TEST FOR DIPHTHERIA (MANZULLA). W. W. FOX, P. S. RHOADS and H. LACK, J. A. M. A. **113**:675 (Aug. 19) 1939.

Manzulla's test consists in the application of a 2 per cent solution of potassium tellurite to a suspected exudate in the throat. If the painted area turns black in ten minutes, Corynebacterium diphtheriae is present. Of 27 patients on whom this test was made by the authors, the reactions in 26 agreed with the cultural findings, and in only a single one did a false positive reaction occur.

HEERSMA, Kalamazoo, Mich.

THE EARLY DIAGNOSIS AND TREATMENT OF POLIOMYELITIS WITH POLIOMYELITIS ANTISTREPTOCOCCIC SERUM. E. C. ROSENOW, Illinois M. J. **76**:114 (Aug.) 1939.

Studies made by special methods indicate a causal relationship of the streptococcus to epidemic poliomyelitis. Poliomyelitis antistreptococcic serum affords a simple method for the early diagnosis of poliomyelitis. The results from the use of this serum in the treatment of poliomyelitis in a period of twenty-two years have been uniformly encouraging.

BARBOUR, Peoria, Ill.

MEASLES IN 1938. A. L. HOYNE, Illinois M. J. **76**:136 (Aug.) 1939.

Hoyne points out that from the standpoint of public health the control of measles has met with little success. Little is gained by placarding; harm may result, for the fear of the placarding often prevents the reporting of suspected cases. Because of the universal susceptibility to measles the prevalence of the disease rises and falls every other year.

In 1938 Chicago experienced its greatest epidemic of measles. Of the 37,861 patients whose cases were reported, 400 were admitted to the contagious disease department of the Cook County hospital, and 92 to the municipal contagious disease hospital. Of the 400 patients, 163 were younger than 5 years of age and 237 were older. Hoyne believes that the average patient with measles is safer in the home than in a hospital for contagious diseases. The principal requirements for admission of the 400 patients to the hospital were the presence of complications and severity of the attack. Of the complications, 22 per cent were bronchopneumonia, 14.7 per cent otitis media, 7 per cent encephalitis (75 per cent of those with encephalitis were over 5 years of age); with a fatality rate of 32.1, 2.7 per cent adenitis; 1.75 per cent appendicitis. Mastoiditis, ethmoiditis, nephritis and edema of the glottis were encountered twice. Of the fatalities, 6.7 per cent occurred among the younger group (under 5 years) and 5.4 per cent among the older group.

Until the identity of the causative organism is established there is not likely to be any diminution of the periodic epidemics. Human convalescent serum is the only reliable remedy for prevention. Immune globulin is not so reliable for complete protection as convalescent serum, but may be used when convalescent serum is not available. For modification, either convalescent serum or immune globulin may be employed late in the incubative period. Convalescent serum has also been used as a therapeutic agent in the preeruptive stage of measles, but not sufficiently to determine its real merit. Hoyne has used aminopyrine for the treatment of measles for several years and still favors its use.

BARBOUR, Peoria, Ill.

MENINGOCOCCIC MENINGITIS: REPORT OF TWENTY-SEVEN CASES TREATED WITH SERUM AND SULFANILAMIDE. E. P. CAMPBELL, M. Ann. District of Columbia **8**:132 (May) 1939.

Campbell gives the essential features of the 27 interepidemic cases of meningococcic meningitis in the Walter Reed General Hospital from October 1935 to November 1938. The treatment given in the 27 cases consisted in the use of antimeningococcus serum, antitoxin and sulfanilamide. Serum was administered intravenously and intraspinally immediately after the necessary sensitivity tests had been performed. Soon after the first spinal drainage, 100 cc. of serum diluted with 200 or 300 cc. of physiologic solution of sodium chloride was given slowly intravenously. The average amount of serum given in this manner to 22 patients was 221 cc., with extremes of 45 and 705 cc. Serum, warmed, undiluted, was given intraspinally by the gravity method and in amounts of from 5 to 10 cc. less than the quantity of spinal fluid withdrawn. Serum was given intrathecally to 18 patients in an average total amount of 106 cc., with extremes of 15 and 340 cc. Antitoxin was given to 3 patients before they were admitted to the hospital. Sulfanilamide was administered to 7 patients in an average total dose of 32.5 Gm., with extremes of 9 and 60 Gm. Five were given both serum and sulfanilamide, while 2 were given sulfanilamide alone. One of the former group died after receiving 14.5 Gm. of sulfanilamide and 100 cc. of serum. A subarachnoid block developed. Sulfanilamide is best employed by mouth if the patient is not vomiting. Otherwise it can be given subcutaneously, as outlined by Schwenkter. There were 36 complications in the entire series, including deafness, transient paralyses of the sixth and seventh nerves, arthritis, optic neuritis, paraplegia, endocarditis, subarachnoid block and panophthalmitis. Five deaths occurred, 2 from acute fulminating meningococcemia and 1 from status thymicolymphaticus. The author believes that the most effective form of treatment was intravenous and intraspinal administration of antimeningococcus serum in conjunction with sulfanilamide orally and/or subcutaneously.

J. A. M. A.

MOSQUITO TRANSMISSION EXPERIMENT WITH POLIOMYELITIS VIRUS. V. H. CORNELL and W. A. DAVIS, Proc. Soc. Exper. Biol. & Med. **42**:78 (Oct.) 1939.

Mosquitoes (100 females of Aedes aegypti and 75 females of Culex pipiens) were allowed to feed on a monkey (Macacus rhesus) which had been inoculated intracerebrally with virus and in which poliomyelitis subsequently developed. These mosquitoes were allowed to feed on 2 healthy monkeys, with no development of the disease in either animal. Intracerebral injections of an extract of these mosquitoes were made, but again no disease developed in the three weeks of observation.

HANSEN, Minneapolis.

EXPERIMENTAL TRANSMISSION OF POLIOMYELITIS TO THE EASTERN COTTON RAT, SIGMODON HISPIDUS. C. ARMSTRONG, Pub. Health Rep. **54**:1719 (Sept. 22) 1939.

Armstrong reports that by using a 5 per cent suspension of brain and cord and a dose of 0.06 cc. intracerebrally, 0.06 cc. intranasally and 0.25 cc. subcutaneously for each animal, a strain of virus, taken from an 18 year old boy in Lansing, Mich., who was suffering with bulbar poliomyelitis, has been carried through a series of seven cotton rat transfers, and symptoms are developing in animals of the eighth transfer. Rat brain and cord obtained on the second and fifth passages caused typical symptoms of poliomyelitis when introduced into monkeys.

Successful transmission to date has been secured with the Lansing strain of virus only, and in attempts to inoculate other rodents the cotton rat is the only one in which positive results have been secured. It is hoped that the cotton rat may prove to be a cheap, convenient and useful animal for the study of poliomyelitis.

SANFORD, Chicago.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES, Pub. Health Rep. **54**:1747 (Sept. 29) 1939.

For the period of Aug. 13, 1939 to Sept. 9, 1939, there was a rise in cases of poliomyelitis of five times the incidence of the corresponding period of the preceding year. Since Jan. 1, 1939, there have been reported 3,554 cases, compared with 1,164 reported in 1938. Every region of the country except New England and the East South Central region show increases. The incidence of influenza was also slightly above the average. The figures for diphtheria, measles, meningitis, scarlet fever and smallpox were below, as was that for typhoid fever. The average mortality rate from all causes was 9.5 per thousand inhabitants, compared with the average rate of 9.8.

SANFORD, Chicago.

FORMULA FOR CULTIVATION MEDIUM FOR PHASE 1 H. PERTUSSIS. J. W. HORNIBROOK, Pub. Health Rep. **54**:1847 (Oct. 13) 1939.

Hornibrook presents the formula of a simplified, serum-free liquid medium which supports a heavy growth of phase 1 Haemophilus pertussis. It has been demonstrated that, aside from organic nitrogen, two groups of substances are necessary for the growth of phase 1 H. pertussis: (*a*) certain polysaccharides and (*b*) sulfur-containing compounds, such as glutathione or cysteine. An unknown substance present in yeast extract stimulates growth but is not essential.

SANFORD, Chicago.

PREPARATION OF DIPHTHERIA ANTITOXIN IN A STATE OF HIGH PURITY. C. G. POPE and M. HEALEY, Brit. J. Exper. Path. **20**:213, 1939.

Pope and Healey have used diphtheria antitoxin which has already been purified by enzyme methods as the starting material in an attempt to secure pure antitoxin. After specific precipitation of the antitoxin by toxin, the toxin in the precipitate was destroyed with pepsin and the liberated antitoxin purified. The product obtained was completely precipitable with toxin and appeared to be free from other antibodies to Corynebacterium diphtheriae. [ARCH. PATH.]

PURIFICATION OF DIPHTHERIA TOXOID. C. G. POPE and F. V. LINGGOOD, Brit. J. Exper. Path. **20**:297, 1939.

Pope and Linggood have investigated the ratio of the theoretic amount of toxin nitrogen to the amount of coagulable nitrogen found in a number of crude diphtheria toxins and toxoids and have shown the presence of a large amount of coagulable protein other than toxin protein in such products. By using a special medium of low nitrogen content they have been able to reduce the amount of this contaminating protein, which can be eliminated almost completely from the resulting toxoids by treating them with charcoal. From such charcoal filtrates it has been found possible to secure toxoids of a purity of 1,500 Lf units per milligram of nitrogen by simple methods involving no acid precipitation. [ARCH. PATH.]

METABOLISM OF LACTIC ACID IN DIPHTHERITIC TOXEMIA. C. R. DAWSON and E. HOLMES, Brit. J. Exper. Path. **20**:357, 1939.

Dawson and Holmes, using intact animals, confirm earlier findings that in diphtheritic toxemia there is a failure in the power of the liver to store glycogen with no corresponding failure in the formation of carbohydrate from noncarbohydrate sources. They show also a diminution in the power to remove lactate from the blood stream when this substance is injected intravenously. They demonstrate a partial restoration of the power of the liver to form glycogen after massive doses of an extract of adrenal cortex. [ARCH. PATH.]

A Microscopical Inquiry into the Etiology of Poliomyelitis with a Note on Chronic Encephalitis Lethargica. A. C. Coles, Edinburgh M. J. **46**:627 (Oct.) 1939.

Air-dried films of the cord, brain and other tissues of poliomyelitic monkeys were obtained from nine research institutes in various parts of the world, including the United States. Several different strains were represented in these preparations. The material secured from human sources unfortunately had been preserved in glycerol for various long periods.

Abnormal microscopic structures are present in films from nerve tissue involved in acute poliomyelitis in both man and monkey. Various-sized bodies (sporelike organisms) staining blue with Giemsa's stain have been found. Larger ones may show deeper-stained spots in their interior, suggestive of developmental changes. Coles suggests that the actual causal virus of poliomyelitis may be found in these elementary bodies; the sporelike bodies, free and within the vessels and the intracellular cystlike bodies may be stages through which the virus finally develops into a filtrable body.

Neff, Kansas City, Mo.

Hemiplegia with Encephalitis in the Course of an Eruptive Fever. R. Poinso and P. Battesti, Bull. Soc. pédiat. de Paris **37**:96 (Feb.) 1939.

In a girl 20 months old there developed right-sided hemiplegia, due to encephalitis, on the fifth day after a fever subsided, when the rash and the site of inoculation, a tic bite over the left posterior superior iliac spine, were still visible. This corresponds with the experimental production of encephalitis with infectious material from patients with Mediterranean eruptive fever (*fièvre boutonneuse*) in guinea pigs and rats.

Benjamin, Montreal, Canada.

Central Vestibular Symptoms Following Diphtheritic Angina. R. Mayoux, Rev. d'oto-neuro-opht. **17**:426 (June) 1939.

Four days after an attack of diphtheria there occurred paralysis of the palate, limbs and mechanism of accommodation, accompanied by slight vertigo. The vertiginous sensations continued and were increased by movements of the head, especially inclination to the right. There followed incoordination of the limbs on the right side, disturbance of deep sensibility, paralysis of the right external rectus muscle and the right twelfth nerve and spontaneous nystagmus on looking to the right, sometimes becoming pendular. There was marked disturbance of equilibrium. A caloric test revealed normal nystagmus and no vertigo.

This observation demonstrates the possibility of the occurrence of central lesions in the course of diphtheria. The homolateral character of the disturbance of deep sensibility indicated the presence of a low bulbar lesion. Usually, vasodilatation caused by the toxin of diphtheria is transitory, but when the intoxication is intense hemorrhagic suffusions or even true hemorrhages in the sheaths of the vessels are produced. This probably occurred in the present case and explains the persistence of the symptoms for seven years.

Dennis, San Diego, Calif. [Arch. Neurol. & Psychiat.]

Subglottic Diphtheria, Initiated by Sudden Asphyxia, Simulating the Presence of a Foreign Body in the Lower Respiratory Tract. C. Ricci, Arch. ital. di otol. **51**:157 (April) 1939.

Ricci reports the case of a child aged 14 months, apparently in perfect health, who, while eating a supper consisting of meat with fragments of cartilage and bone, suddenly became dyspneic, coughed violently and was cyanosed. Examination revealed almost complete immobility of the left lung without alteration in the voice or the cough. Direct laryngotracheoscopic examination revealed only slight congestion of the pharyngeal and laryngeal mucosa. Owing to the alarming condition of the child, immediate tracheotomy was done, after which the left lung immedi-

ately began to function and the cyanosis and distress were relieved. Respiratory difficulty recurred the following morning, together with profuse sweating, a rapid pulse rate, moderate cyanosis and rise of temperature. A roentgenogram revealed bronchopneumonia in the apex of the right lung. Death occurred seventeen hours after the onset. Autopsy revealed a diphtheritic membrane on the lower surface of the vocal cords and subglottic region, the presence of streptococci and Loeffler's bacilli and fatty degeneration of the liver, spleen and myocardium. The location of the diphtheritic membrane explains its oversight during the direct examination. It is assumed that the atelectasis was caused by toxic spasm of the left bronchus. Instances of diphtheria simulating a foreign body in the respiratory tract are rare; more common are cases of a foreign body simulating croup. The diagnosis in such cases is usually made late or at the autopsy table.

DENNIS, San Diego, Calif. [ARCH. OTOLARYNG.]

ATYPICAL DIPHTHERIA (CLINICAL NOTE). L. ANGELINI, Pediatria **47**:392 (May) 1939.

Four cases of atypical diphtheria are presented, in which were found anomalous characteristics of the bacillus of Löffler. No growth occurred in the culture tubes for the first forty-eight hours. Subsequently there was noted the presence of small blackish colonies (the culture medium used consisted of a mixture of egg yolk, glycerin and tellurite). There was noted also an atypical appearance of the colonies. The bacilli were finally isolated in pure culture.

The presenting symptom in 3 cases was progressive pallor. There was slight redness of the pharynx, and a thin exudate covered the pillars. There was no elevation of temperature. In 1 case the temperature varied between 37.4 and 37.5 C. (99.3 and 99.5 F.). Antidiphtheritic serum brought about improvement, and cultures of the throat became negative. Angelini points out that it is advisable in cases in which suspicion has been aroused to keep the culture tubes under observation for three days.

MARTOCCIO, Utica, N. Y.

RESPIRATORY ARRHYTHMIA IN DIPHTHERIA. A. NÁDRAI, Ann. pædiat. **152**:35 (Oct.) 1938.

Nádrai reports on a series of electrocardiograms of children with diphtheria, taken in order to study the changes of respiratory types and sinus arrhythmia. At the same time the tone and excitability of the autonomic nervous system were examined. The results show that changes were due rather to alterations in the tone of the autonomic nervous system than to the state of the myocardium. The time of the appearance and the degree of the sinus arrhythmia can be assessed as prognostic signs only with great reserve; i. e., the presence of sinus arrhythmia does not mean either arrest of possible myocarditis or restitution of the heart to complete function. The sinus arrhythmia is caused by a lesion of the neuromuscular apparatus of the heart. On account of the lability of the heart's function it is advisable in such cases to rest the heart as much as possible. Whereas the sinus arrhythmia is undoubtedly a physiologic symptom intended hemodynamically to spare the heart, the other so far not sharply defined forms of sinus arrhythmia, i. e., the arrhythmia of old age and of convalescence, cannot longer be called physiologic.

FROM AUTHOR'S SUMMARY.

ATYPICAL POLIOMYELITIS AND ITS ETIOLOGIC RELATIONSHIP TO ACRODYNIA. E. MAYERHOFER, Ann. pædiat. **153**:144 (June) 1939.

Certain forms of atypical poliomyelitis, especially if they involve the brain (encephalopoliomyelitis), may be followed immediately by infantile acrodynia (pink disease). Infants with encephalopoliomyelitis followed by pink disease show not infrequently during convalescence a syndrome (otherwise completely alien to the convalescence after poliomyelitis) of hyperemic, warm sweating and later

maceration and peeling of the palms and soles. These "acrosigns" therefore do not belong to the picture of poliomyelitis but to that of pink disease caused by encephalopoliomyelitis.

In a considerable number of patients with encephalopoliomyelitis followed by pink disease Mayerhofer could identify prior to the onset of the poliomyelitis common nonspecific infections of the intestine, "enteritis poliomyelitis" (Mayerhofer). Such cases of indirectly enteritic acrodynia supplement the cases of directly enteritic acrodynia described by Debré and his co-workers. Cases of enteritic poliomyelitis in which infantile acrodynia develops during the convalescence after poliomyelitis form a bridge between the purely enterogenic theory of Debré and the theory of other authors that pink disease has a purely infectious origin. If one accepts the enterogenic theory, one does not want to exclude the theory of an infectious origin or any of the other etiologic theories as to the origin of pink disease (at present twelve groups).

The common etiologic factor for the directly (Debré) and the indirectly (Mayerhofer) alimentary acrodynia and many other acropathias, such as ergotism, ustilaginism, pellagra and chronic arsenism, has to be looked for in damage to the mesencephalon (infundibulum).

FROM AUTHOR'S SUMMARY.

STELLULAE PALMARES ET PLANTARES SCARLATINAE. E. FREUDENBERG, Ann. pædiat. **154**:280 (Feb.) 1940.

Stellulae palmares et plantares are an important sign at the beginning of scarlet fever and on the appearance of the secondary rash. They clinch the diagnosis if the exanthem is missing or dubious. The time and site of their appearance are described. As they usually persist longer than the rash, the doctor may, even if the rash has not been observed by him but has only been described to him, form a conclusion as to its scarlatinal nature from their appearance. Knowledge of the stellulae makes it possible to recognize cases of scarlatina which may otherwise be the source of further infections in a family or a hospital. This fact shows the epidemiologic importance of this sign.

The stellulae are a vasomotor phenomenon which is caused by central toxic effects and irritations, especially those of allergic origin. For this reason they may appear frequently in syntropism with the sharply demarcated malar flush and the anemic nasolabial triangle, even without scarlet fever. This fact, however, does not diminish their value in the diagnosis of scarlatina. The foregoing interpretation presents a contribution toward the morphology of scarlet fever.

FROM AUTHOR'S SUMMARY.

TREATMENT OF POSTDIPHTHERIC PARALYSIS WITH VITAMIN B_1. P. FEIGE, Fortschr. d. Therap. **15**:333 (June) 1939.

Reviewing 1,590 cases of diphtheria which were observed during the years 1936 and 1937, Feige found 100 cases in which postdiphtheritic paralysis developed. Paresis of the soft palate was observed in 90 cases, paresis of the ocular muscles in 20 cases, paralytic symptoms of the legs in 23 cases, paralysis of the pharyngeal muscles in 18 cases, paralysis of the respiratory musculature in 4 cases, paralysis of the musculature of the neck and back in 3 cases and paralysis of the diaphragm only once. Some of the children had more than one form of paralytic symptoms, and in 18 cases the paralysis threatened life. Of the 60 patients in whom the entire course of the postdiphtheritic paralysis could be observed, 30 were treated with a preparation of vitamin B_1 and 30 either received no treatment for the paralytic symptoms or were treated with other medicaments. A comparison of these two groups of patients revealed that in those who were treated with vitamin B_1 the paralytic symptoms persisted on the average for twenty-nine and six-tenths days, whereas in the other group they persisted on the average for forty-nine days. The author administered the vitamin B_1 by mouth and by intramuscular injection

on alternate days. On one day the children were given three times 1 tablet containing 1 mg. of the vitamin, i. e., 1,200 pigeon units; on the following day they were given an intramuscular injection of 1 cc. of a vitamin B_1 preparation which contained 4,000 pigeon units. In discussing the genesis of postdiphtheritic paralysis, the author cites observations of several investigators and suggests that these postdiphtheritic paralytic symptoms are the result of the concurrence of toxic impairment of the tissues and lack of the B_1 substance, which has a ferment-like action. He thinks that this explains at the same time the success of the treatment with vitamin B_1.

J. A. M. A.

SUDDEN DEATH FOLLOWING DIPHTHERIA. J. CAMERER, Monatschr. f. Kinderh. **79**:307, 1939.

An 8 year old boy made a perfect recovery from diphtheria and then died suddenly on the twenty-ninth day, when apparently in good health. The autopsy showed both generalized status thymicolymphaticus and decided changes in the heart muscle. Camerer shows photomicrographs of the myocardial involvement and believes that the sudden death was due primarily to involvement of the conduction system.

GERSTLEY, Chicago.

EPIDEMIOLOGIC STUDIES OF POLIOMYELITIS IN THE UNITED STATES. J. R. PAUL, München. med. Wchnschr. **85**:430 (March 25) 1938.

The editor requested Paul, of New Haven, Conn., to contribute an article on the recent American contribution to the epidemiology of poliomyelitis. The article is a thorough résumé, which does not lend itself to brief abstracting.

BRAHDY, Mount Vernon, N. Y.

ACTION OF BEHRING'S SERUM IN DIPHTHERIA. P. BAMBERGER, München. med. Wchnschr. **85**:441 (March 25) 1938.

This is another article presenting the beneficial effect of serotherapy in diphtheria and urging that serum be used early in the disease.

BRAHDY, Mount Vernon, N. Y.

ACTIVE IMMUNIZATION AGAINST DIPHTHERIA IN TUBERCULOUS CHILDREN. H. BERGER, München. med. Wchnschr. **85**:551 (April 15) 1938.

During the last few years there has been a steady increase in diphtheria. Only since 1934 have immunizing products with a high antigenic potency but harmless been available in Germany. Since then programs of immunization have been conducted in certain districts and cities. All these communities have had a decrease in the morbidity and mortality from this disease not only among the immunized children but in the population as a whole. Berger undertook to find out whether it was safe to give tuberculous children diphtheria toxoid. Protection against diphtheria is especially important in institutions where children are not confined to bed. He found that two doses of alum-precipitated toxoid, containing 30 units per cubic centimeter, were effective and harmless.

BRAHDY, Mount Vernon, N. Y.

ICTERUS IN SCARLET FEVER. WISCH, München. med. Wchnschr. **86**:808 (May 26) 1939.

The kind and frequency of the complications of scarlet fever vary in different epidemics. Formerly glomerulonephritis was a frequent complication. In the last ten years it has been found only 4 or 5 times among 700 cases of scarlet fever. Similarly jaundice, which was always an infrequent complication, has now become a rarity. For that reason Wisch reports 2 cases of scarlet fever complicated with

jaundice. One of the patients was a 29 year old man and the other an 8 year old boy. In the first patient jaundice appeared during the first week and disappeared in about eight days. As the jaundice was subsiding arthritis appeared and lasted about a week. The successive occurrence of the jaundice and the allergic arthritis, according to Wisch, indicates an allergic basis for the hepatic disorder. In the second patient cervical adenitis developed, and during the second week jaundice was noticed. The jaundice disappeared in ten days. The rapid cure in both instances is indicative of an allergic condition due to the scarlatinal toxin. The jaundice which occurs during the first to the third week is benign and disappears rapidly.

BRAHDY, Mount Vernon, N. Y.

TIME OF AGGLUTININ FORMATION AGAINST BORDET-GENGOU BACILLI. W. DIENST, Ztschr. f. Kinderh. **61**:148 (Aug. 9) 1939.

The author and Bennholdt-Thomsen reported previously that the infant is capable of responding to vaccination with pertussis bacilli by a positive agglutination reaction as early as the fourth week and with a positive complement fixation reaction at the sixth month.

In this article Dienst reports experimental work which supports the findings in infants. Guinea pigs respond with positive agglutination reactions on the thirteenth day and with positive complement fixation reactions in the fifth week.

SIEMSEN, Chicago.

DIPHTHERIA OF THE VULVA IN CHILDREN. V. A. PETROVA, Vestnik. ven. i dermat., 1939, nos. 2 and 3, p. 71.

Attention is called to the fact that in spite of the frequent incidence of diphtheria of the vulva in girls, with its characteristic clinical picture, the diagnosis is frequently missed. The author reports his observations on diphtheria of the vulva in 13 girls 1½ to 8 years of age. The most characteristic symptom seems to him the complete retention of the urine; this symptom was present in 8 cases, while in 5 there was no retention because pain on urination was less severe. Objective signs are edema of the vulva and dryness and a bluish color of the tissues. In some places the tissues are ulcerated and covered with white and gray membranes, the removal of which bares a bleeding surface. With more severe involvement there are areas of necrosis. These manifestations are particularly pronounced in the region of the urethral opening, which seems to be the main reason why urination is painful. The discharge from the vulva was bloody in 9 cases. In 3 cases, in which the condition was less severe, the discharge was insignificant and more purulent, and there was no formation of membranes. In these cases the diagnosis of diphtheria was thought of because of the dryness and the cyanosis of the tissue. In another case the discharge was abundant and purulent, but the dryness of the vulva and the fact that one of the other children had diphtheria of the throat suggested a diagnosis of diphtheria in this case too. In this case there was an associated gonorrheal infection. Another fairly constant sign is enlargement of the inguinal glands. Association with diphtheria of the throat seems to be rare, occurring but once in the author's cases. General intoxication, malaise and even increase in body temperature are frequently absent in diphtheria of the vulva. In the cases of 2 sisters, in spite of a laboratory report of "suspicious of diphtheria," a diagnosis of diphtheria was made because of the characteristic picture, the infectiousness of the disease and the improvement following specific treatment. In another case, in which there were only local symptoms and the clinical course was milder, a diphtheroid bacillus was found. The author believes that the diphtheria bacillus may change its morphologic appearance and assume the form of a diphtheroid bacillus, which, although considered nonpathogenic, may under favorable conditions produce a pathologic process of the vulva resembling true diphtheria.

In 10 of the 13 cases there was a preceding chronic vulvovaginitis. The author believes that diphtheria of the vulva develops most frequently as a secondary

infection superimposed on a still present or on a past chronic gonorrheal vulvovaginitis.

The prognosis is poor only for patients with severe symptoms or for those who are neglected. In only 1 case were there severe complications, and in that case there was no associated diphtheria of the throat.

The author reports also 3 cases of diphtheria of the penis, a disease which is much rarer than diphtheria of the vulva. As in the disease in the female sex, there were retention of urine, the characteristic changes in the tissues and a discharge.

BLOOM, New York. [ARCH. DERMAT. & SYPH.]

CARDIAC OUTPUT AND METABOLISM IN NORMAL CHILDREN AND IN CHILDREN WITH DIPHTHERIA. P. PLUM, Acta pædiat. **24**:278, 139.

On the basis of 100 determinations of metabolism in 27 normal children, the following conclusions are reached: The rate of metabolism can be measured accurately in children. Standards based on weight and surface area remain the most acceptable; those of Lucas and Pryor, as well as those of Bierring and of Lewis, are to be recommended. The metabolism of very thin children and of those who are obese is not directly comparable with that of children whose nutrition is average. The intensity of metabolism falls consistently throughout childhood.

The minute volume of the heart was determined in 14 normal children aged from 4¾ to 13½ years. It is relatively greater in children than in adults. The arteriovenous oxygen difference is the same in children as in adults.

Two hundred determinations of minute volume were made by Grollman's method on 15 children with diphtheria. The arteriovenous oxygen difference was normal in all cases. The metabolism fell slightly with defervescence; the respiratory quotient was found to be low in the febrile stage. The temperature of the skin of the lower extremities was lowered during the acute stage of the disease, and capillary microscopic examination revealed impaired circulation.

McCUNE, New York.

DIPHTHERIA IN STOCKHOLM: A STUDY IN SOCIAL HYGIENE. R. BERGMAN, Acta pædiat. **24**:280, 1939.

From 1928 to 1933 approximately 1,800 patients with diphtheria that had originated within the city were treated in the Hospital for Infectious Diseases of Stockholm. In 70 per cent of the patients the primary lesion was pharyngeal; in 25 per cent it was nasal. The mean annual mortality was 1.4 per cent. Children were much more often attacked than adults. Women were more vulnerable than men. A third of the patients came from institutions. Certain sections of the city contributed a disproportionately large number of patients.

McCUNE, New York.

GENERATION CURVES OF SCARLATINA IN THE NETHERLANDS. J. T. TERBURGH, Nederl. tijdschr. v. geneesk. **83**:3473 (July 8) 1939.

In epidemiologic studies of scarlet fever generation curves are indispensable. From these curves it is learned that, as in diphtheria, there is an increase in the risk of infection in the first years of life, caused by the increasing contact of young children with the outer world. The immunity to which the more widespread infections give rise leads to a decline in case incidence. The interaction of these two factors determines the morbidity of the country; the latter, again, exercises its influence, as the morbidity level determines the number of sources of infection and thereby the risk of infection for *all* age groups.

From the curves of the observation period (1921-1936), holding for Holland only, the impression is gained that scarlet fever is more infectious than diphtheria and that the proportion between cases of latent infection and cases of active infection, which is fairly constant in diphtheria, in scarlet fever is much influenced

by the whole morbidity level. For the entire country the chance of contracting the disease can be estimated at about 10 per cent of the cases of infection, whereas for diphtheria this chance was calculated at 5 per cent. Epidemics of both diseases can be prevented only by general immunization of preschool children.

VAN CREVELD, Amsterdam, Netherlands.

NEWER CONCEPTIONS OF SCARLET FEVER. W. K. DICKE, Nederl. tijdschr. v. geneesk. **83**:4106 (Aug. 19) 1939.

After a brief review of the prevailing notions of the clinical picture of scarlet fever Dicke demonstrates, by evidence from the literature and from his own experience, that these notions are no longer tenable. Instead of the rash, the pathogenic streptococcus is placed in the center. The diseases due to these organisms are brought together in a diagram. Griffith's typing of hemolytic streptococci gives the clue to this unitarian view. Hemolysis is no absolute criterion of pathogenicity.

VAN CREVELD, Amsterdam, Netherlands.

SEVERE LESIONS OF THE EYE IN SCARLET FEVER. H. W. SCALONGNE, Nederl. tijdschr. v. geneesk. **83**:4722 (Sept. 30) 1939.

Four children with scarlet fever had severe lesions of the eye. The first child had conjunctivitis, keratitis, phlegmon of the upper lid and retrobulbar abscess in one eye. These lesions healed, leaving a large residual corneal macula. Then the other eye became affected and showed conjunctivitis, phlegmon of the upper lid, panophthalmia and atrophy of the bulb. The second patient showed conjunctivitis, keratitis, phlegmon of the upper lid, atrophy of the bulb in one eye, and in the other eye, almost simultaneously, conjunctivitis and keratitis. The third child was admitted with conjunctivitis in one eye. Soon keratitis and phlegmon of the upper lid developed, which healed, leaving a small macula. After this eye had practically healed, a phlegmon developed in the upper lid of the other eye, followed by eversion of the lids, necrosis of the conjunctiva and probably panophthalmia. Postmortem examination showed purulent meningitis. In the fourth child there was purulent meningitis, followed by phlegmon of the upper lid of one eye and keratomalacia, which healed, leaving a macula on the lower half of the cornea. Vision was good. Almost simultaneously the other eye showed a phlegmon of the upper lid and keratoconjunctivitis, which healed, leaving a small macula. The nasolacrimal duct could not be considered a route of infection, as has been described in the literature. Nor could secondary infection be clearly demonstrated as a cause. The possibility therefore presents itself of hypovitaminosis as a cause or a factor in the development of the lesions. Although some indications of this condition were present, no valid proof could be furnished.

VAN CREVELD, Amsterdam, Netherlands.

POLIOMYELITIS. N. A. BOLT, Nederl. tijdschr. v. geneesk. **83**:5141 (Oct. 28) 1939.

On the basis of observations made in general practice during two outbreaks of poliomyelitis with 10 and 9 cases, respectively, the general practitioner is given the following advice as to the lines on which to act in dealing with incipient poliomyelitis:

1. In case of an outbreak of poliomyelitis examine daily every child presenting signs of an infectious disease (catarrhal signs) for meningeal symptoms.
2. On the advent of such symptoms, immediately carry out lumbar puncture and examination of the spinal fluid.
3. On finding the changes that occur in the spinal fluid in poliomyelitis, immediately apply convalescent serum by the lumbar and intramuscular routes.

VAN CREVELD, Amsterdam, Netherlands.

Acute Infectious Diseases

STUDIES ON OXYURIASIS: XIV. CONTROLLED TESTS WITH VARIOUS METHODS OF THERAPY. W. H. WRIGHT, Pub. Health Rep. **54**:2005 (Nov. 10) 1939.

These controlled tests were carried out at the Providence Hospital, Washington, D. C., by methods previously described by the author. Single doses of santonin daily were only 50 per cent efficient. Hexylresorcinol in 1:2,000 dilution by enema is of considerable value in treatment (minimum, ten enemas in three weeks). Hexylresorcinol by mouth was ineffective, even when supplemented by enemas. The most effective treatment was by the insertion of 1 ounce (31 Gm.) of 1:1,000 hexylresorcinol jelly in the rectum at bedtime. Nonmedicated enemas, including soapsuds and saline enemas, are sometimes of advantage in treating pinworm infections in infants and young children if repeated every other night for at least three weeks.

SANFORD, Chicago.

INCIDENCE OF TRICHINOSIS IN THE MIDDLE SOUTH. G. T. HARRELL, South. M. J. **32**:1091 (Nov.) 1939.

Harrell reports that infestation with trichinas is found in 3.5 to 27.6 per cent of persons coming to autopsy. This common infestation is rarely recognized clinically except in epidemics. The incidence in autopsy material varies with the method of detection and the part of the United States in which the study is made. In North Carolina the incidence in persons coming to autopsy, chiefly native-born farmers (Negroes and persons of Scotch-Irish-English descent), is 2.8 per cent, as demonstrated by muscle press and digestion technics.

Harrell states that meat from garbage-fed hogs is probably the chief source of human infection. Most Southern hogs are grain-fed, and the incidence of trichinal infestation in hogs and man is much lower there than elsewhere.

SCHLUTZ, Chicago.

INTESTINAL PARASITE SURVEY IN ALABAMA. W. H. Y. SMITH, D. G. GILL and J. G. MCALPINE, South. M. J. **32**:1094 (Nov.) 1939.

A survey of school children for infestation with intestinal parasites was made in Alabama. Of 253,630 children examined, 38,810, or 15.3 per cent, harbored hookworm.

Ascaris lumbricoides was found in 2,741, or 1.1 per cent of the total number. The distribution of Ascaris in Alabama is rather haphazard, with counties showing low rates of infestation contiguous to counties with high rates.

Taenia nana was found in 3,605 children, or 1.4 per cent.

Trichuris trichiura is not much of a problem in Alabama, since only 105 infested persons were found among 253,630 examined.

The incidence of Oxyuris vermicularis in an institution for mentally deficient persons was determined. The unusually high infestation rate of 65.15 per cent was found; the infestation rate was much heavier among the males than among the females. In this institutional survey a comparison was made of salt flotation and anal swabbing in determining the presence of this type of infestation. The superiority of anal swabs was quite definite.

SCHLUTZ, Chicago.

RAT BITE FEVER IN CHILDREN. H. M. GILKEY and C. C. DENNIE, South. M. J. **32**:1109 (Nov.) 1939.

Gilkey and Dennie state that the important points for diagnosis are the history of the bite and a relapsing fever. The disease is uncommon.

Treatment consisting of seven to ten injections of neoarsphenamine has proved successful.

SCHLUTZ, Chicago.

GONOCOCCAL OPHTHALMIA AND BURSITIS. B. BARSBY, Proc. Roy. Soc. Med. **32**:1208 (Aug.) 1939.

Gonococcic ophthalmia and bursitis were observed in an infant of 5 weeks. On admission to the hospital the child's eyes were discharging, and there was a swelling over the left shoulder. The mother stated that she had had only a slight vaginal discharge, occurring during the middle three months of the pregnancy, and that it lasted only a week. A smear from the child's eyes showed gonococci, and pus aspirated from the anterior aspect of the involved joint showed gonococci.

WILLIAMSON, New Orleans.

MENINGEAL MANIFESTATIONS AND ACUTE MENINGITIS OF TYPHOID AND PARATYPHOID ORIGIN. N. FACATSELLI, Arch. de méd. d. enf. **42**:615 (Oct.) 1939.

Among the autonomous infections due to the typhoid and the paratyphoid organisms, cholecystitis may be considered as the most individualized, and meningeal assaults, ranging from a mild form of meningismus to the suppurative type of typhoid meningitis, as the most pleomorphic. Such complications were known and recorded as early as 1843, by Lombard, of Geneva, Switzerland, even though the etiologic agent was not identified until 1880, and the technic of spinal puncture was not developed until 1891.

The involvement of the meninges may be divided into three types: (1) mild forms, with which the spinal fluid is sterile and shows little or no change in its elements; (2) more serious invasions, with which the spinal fluid is still sterile but shows important chemical and cytologic changes, and (3) frank meningitis, with which the spinal fluid is purulent and shows a great number of Eberth's or paratyphoid bacilli. Several illustrative cases of each type are reported in full.

AMESSE, Denver.

TETANUS TOXOID AND THE PROPHYLAXIS OF TETANUS IN MAN AND THE DOMESTIC ANIMALS. G. RAMON, Presse méd. **47**:877 (June 3) 1939.

Ramon advocates the use of toxoid in persons likely to be exposed to tetanus. The injections can be satisfactorily combined with other routine injections, such as diphtheria toxoid or antityphoid vaccine. A summary is presented of the results which are being obtained in various countries. with special reference to army administration.

DAFFINEE, Boston.

RESPIRATORY FORM OF MALARIA. J. FRICKER, Presse méd. **47**:967 (June 17) 1939.

Three children in a single family were seized with what seemed to be simple grip. Signs of a pneumonic infection were also present. Plasmodium falciparum was identified in the blood. A brother of these children and 2 other persons were seized with the same symptoms and showed the same pneumonic lesions. All the patients responded to quinine treatment. Fricker raises the question whether the offending organism may have had a special affinity for lung tissue.

DAFFINEE, Boston.

MENINGOENCEPHALITIS IN TYPHOID FEVER DURING CHILDHOOD. E. PELUFFO and C. E. CASTELLS, Arch. de pediat. d. Uruguay **10**:35 (Jan.) 1939.

Typhoid fever in the child, like all acute infectious diseases, may cause meningoencephalitic complications of varying degrees of severity and localization. The frequency of occurrence of this manifestation is related to the severity of the

typhoid attack. Of all the symptoms referable to the central nervous system, the meningeal are the ones most commonly observed. Their appearance warrants a grave prognosis. The treatment is entirely symptomatic. SCHLUTZ, Chicago.

Chronic Infectious Diseases

SOURCES AND PROPHYLAXIS OF TUBERCULOSIS AMONG SCHOOL CHILDREN. A. COURCOUX and H. GAVOIS, Paris méd. **1**:25 (Jan. 7) 1939.

School children rarely infect each other with tuberculosis except between the ages of 14 and 17 years. Their infection is much more frequently contracted from the teaching personnel. The legislation in force in France at the present time does not permit systematic examination of teachers, and too frequently the tracking down of a source of infection comes only because of an increased incidence of tuberculosis among the children. LESLIE, Evanston, Ill.

THE PEDIATRICIAN IN THE STRUGGLE AGAINST TUBERCULOSIS. C. ARAOZ ALFARO, An. Soc. de puericultura de Buenos Aires **3**:149 (July-Sept.) 1937.

There is a most important place for the pediatrician in the struggle against tuberculosis. First he can look after the children under his care as to health, environment and contact with persons suspected of having tuberculosis. There is the physical examination, the check-up, the tuberculin test and then the use of the roentgen ray if necessary. Proper education for insuring a good environment is most important. HERRON, Oak Ridge, La.

THE ANTITUBERCULOSIS STRUGGLE IN THE DISPENSARY. P. R. CERVINI, J. V. TISCORNIA, C. A. URQUIJO and M. WAISSMANN, An. Soc. de puericultura de Buenos Aires **3**:177 (July-Sept.) 1937.

The authors point out the importance of finding the source of infection and stress the importance of obtaining municipal aid in fighting the infection when the source is not in the family. Proper hygiene and the help of the municipal authorities have been beneficial, but little benefit, if any, has been obtained from the use of BCG vaccine in the prevention of tuberculosis. HERRON, Oak Ridge, La.

VACCINATION WITH BCG AND ITS IMPORTANCE IN THE ANTITUBERCULOSIS CAMPAIGN. A. A. RAIMONDI, Rev. méd. latino-am. **24**:529 (March) 1939.

During the past thirteen years the department of health of Buenos Aires has vaccinated 56,000 children against tuberculosis with BCG. The work was suspended temporarily because of the tragic result of the similar procedure in Lübeck, Germany, in 1930 but was shortly resumed and has demonstrated its value in the prevention of tuberculosis. Newborn infants of tuberculous mothers have been given by mouth, at two day intervals, three doses of 10 mg. each of an emulsion of BCG. These infants are then separated from their mothers. Older children, too, are removed from the source of infection during the preallergic period, which is four to eight weeks after vaccination.

The results are better when the vaccine is given subcutaneously. When this is not followed by a positive tuberculin reaction within six months, the child should be revaccinated. It is advisable to vaccinate older children and healthy adults who give a negative tuberculin reaction.

In this study no intolerance or other disturbance has been observed, and no contraindication to the use of BCG has been noted.

The offices of the civil registrar have been used in propagandizing this method of control of tuberculosis, and special attention is given to systematic vaccination in all the public and private maternity hospitals of the city.

DWYER, Kansas City, Mo.

FOUR CASES OF PRIMARY TUBERCULOSIS OF THE SKIN IN INFANTS AND SMALL CHILDREN; SECONDARY LUPUS FORMATION. G. SCHACHENMANN, Arch. f. Kinderh. **116**:33 (Jan.) 1939.

According to Ghon and Kundlich, primary tuberculosis occurs in the skin in 0.14 per cent of the cases, whereas in 95.93 per cent of the cases it occurs in the lungs. In the University Clinic of Zurich, 4 patients with primary tuberculosis of the skin were encountered in the period from 1929 to 1937. The first was a 4 month old infant with the primary focus on the forehead at the base of the nose, and with regional, draining adenitis; tubercle bacilli were isolated from the glandular discharge. The second patient was a 3 year old girl with the primary lesion on the left cheek. The third patient was a 3 year old girl with an ulcer on the labium minus and inguinal adenitis; from the discharge of the inflamed glands, tubercle bacilli were obtained. The fourth patient was also a 3 year old girl, who had the primary lesion on the arm as a result of a burn; tubercle bacilli were obtained from a discharge from the axillary glands. In each instance the source of the primary infection was definitely established. The outcome was excellent in every case, and the author believes the prognosis to be good. One child has been followed for nine years and seems to be normal in every respect. HANSEN, Minneapolis.

ROLE OF CONGENITAL SYPHILIS IN CHOREA MINOR. R. A. CHERSONSKI, Vestnik ven. i dermat., 1939, no. 1, p. 36.

Of 180 patients with chorea observed by the author during the past ten years, 6 were congenitally syphilitic. However, the typical course of chorea with manifestations referable to the heart and to the vascular system, and the cure brought about by the usual therapy with arsenic and salicylates, speak for the rheumatic origin of chorea minor. In only a single case was the chorea possibly a symptom of syphilis. The author believes that the congenital syphilis which is present in some cases of chorea is only a predisposing factor.

BLOOM, New York. [ARCH. DERMAT. & SYPH.].

INCIDENCE OF LATENT TUBERCULOUS INFECTION AMONG CHILDREN OF DIFFERENT AGES IN GÖTEBORG, SWEDEN. N. JOHANNSEN, Acta pædiat. **24**:451, 1939.

Investigations made at the beginning of the present century showed an extremely high incidence of occult tuberculous infection. More recent studies have revealed lower figures; they have also shown considerable discrepancy in results depends on the type of cutaneous test employed, the character of the region under survey and the prevailing economic condition of the population submitted to scrutiny. As far as the Scandinavian peninsula is concerned, recent studies in Norway have shown that about 40 to 50 per cent of 13 year old children are infected; Swedish statistics state that the Pirquet test is positive in 20 to 45 per cent of children at 7 years of age and in 45 to 88 per cent at 13 years.

The present report concerns the results of testing 3,373 children aged 1 to 15 years, between 1927 and 1938. The percutaneous test was employed first; all negative reactors then received an intracutaneous test with 1 mg. of tuberculin. Of the 3,373 children, 18.5 per cent reacted positively to the percutaneous test and 22.4 per cent to the Mantoux test. With respect to age, of the subjects 1 year old, 3.8 per cent reacted positively; of those 5 years of age, 18.2 per cent; of those 10 years of age, 35.0 per cent, and of those 15 years of age, 45 per cent. The number of positive tests obtained annually since 1928 showed a steady decline. This is ascribed to the intensive campaign to eradicate tuberculosis which has been carried out in Göteborg, Sweden, where the inquiry was made.

MCCUNE, New York.

Diseases of Blood, Heart and Blood Vessels and Spleen

SURGICAL MANAGEMENT OF THE PATENT DUCTUS ARTERIOSUS. ROBERT E. GROSS, Ann. Surg. **110**:321 (Sept.) 1939.

When the fetus is born and the lungs expand, the ductus arteriosus normally closes, and all of the blood passes through the pulmonary bed to be aerated. If this vessel fails to close, a reversal of flow takes place within the ductus because pressure in the pulmonary artery is reduced and aortic pressure is increased. There is considerable difference of opinion regarding the time when the ductus Botalli ceases to function. The author states arbitrarily that a ductus Botalli which is still open after the first year of life should be regarded as abnormal. The child with a patent ductus faces an uncertain future. He may live in relatively good health till old age, or his life may be quickly terminated by some complication arising from the lesion. The causes of death may be listed as rupture of the ductus, thrombosis of the ductus with subsequent embolism, bacterial endocarditis or endarteritis and cardiac decompensation resulting from the arteriovenous communication.

Clinical Signs and Symptoms.—About two thirds of the patients are females. Retardation in physical development is extremely common. Most patients have only slight cardiac embarrassment in the early years of life. Epistaxis may be profuse. The patients are usually conscious of a greatly intensified heart beat. A buzz or a hum in the chest is frequently spontaneously noticed by the patient.

The physical manifestations of patent ductus may be entirely wanting in infancy, are apt to be confusing in the first two or three years of life but are almost always typical after the fourth year. At this time the action of the heart is extremely forceful, with increased rate. There is a loud, rough, continuous murmur, heard best in the second or third interspace to the left of the sternum. Roentgen examination shows cardiac enlargement, particularly of the left ventricle, prominence of the pulmonary artery and increased markings of the lung fields due to vascular congestion in the lesser circulation.

The positive critera for operation are:

1. Reasonable assurance that the ductus is patent.
2. Roentgen evidence of congestion in the lung fields.
3. Prominence of the pulmonary artery roentgenologically.
4. Roentgen evidence of cardiac enlargement.
5. Peripheral blood pressure which has an essentially normal systolic level but a definitely lowered diastolic level.

The author discusses the operative treatment and postoperative care. The feasibility of operation is demonstrated by the report of 4 cases in which it was performed without mortality or complications. BANTIN, Omaha.

IDIOPATHIC FAMILIAL LIPEMIA. L. EMMETT HOLT JR., FRANCIS X. AYLWARD and HARRY G. TIMBRES, Bull. Johns Hopkins Hosp. **64**:279 (May) 1939.

A girl aged 11 years had extreme lipemia due primarily to neutral fat and associated with hepatomegaly, splenomegaly, psoriasis, peculiar ulcerations of the skin and malnutrition. Periodic acute attacks of abdominal pain occurred, accompanied by a sudden reduction of fat in the blood, enlargement of the liver and spleen and engorgement of the abdominal veins. There was evidence that the disorder was familial.

The condition was not improved by lecithin, choline, thyroxin, insulin, "lipocaic" or anterior pituitary therapy. It could, however, be in large measure controlled by a diet low in fats. Some evidence was obtained of a beneficial effect of transfusion.

The various types of disturbance which may give rise to lipemia are discussed It is suggested that the condition described is due to a defective mechanism for removal of fat from the blood by the liver, a mechanism in which a humoral factor appears to be concerned.

FROM THE AUTHORS' SUMMARY.

IRON METABOLISM IN INFANCY: I. FACTORS INFLUENCING IRON RETENTION ON ORDINARY DIETS. HUGH W. JOSEPHS, Bull. Johns Hopkins Hosp. **65**:145 (Aug.) 1939.

Iron balance was studied with a large number of infants for the purpose of ascertaining the factors influencing retention of iron in infants on milk and cereal diets.

There was evidence to show that on the average approximately 60 per cent of the iron taken in with the food was absorbed. Excretion tended to vary with age, being somewhat greater in the first three months of life but thereafter relatively constant.

Retention of iron tended to be below the average normal during infections and in infants not receiving vitamin D. In cases of infection the diminished retention seemed to be due to the reduction in intake caused by loss of appetite; in cases of vitamin D deficiency there appeared to be an actual diminution of iron absorption. Deviation from normal levels of retention, however, was never enough to contribute significantly to iron deficiency.

Retention of iron tended to be above the average in cases of anemia even when the hemoglobin level was falling. While the amount of extra retention was not great, it was felt that this occurrence rather opposed the idea of iron deficiency in the ordinarily accepted sense and pointed to the possibility that "avidity" of the tissues for iron might be a factor in the production of anemia. It was pointed out that the conception of iron deficiency must include consideration of availability of iron.

FROM THE AUTHOR'S SUMMARY.

DIAGNOSTIC SIGNIFICANCE OF CHANGES IN LEUCOCYTES. M. M. WINTROBE, Bull. New York Acad. Med. **15**:223 (April) 1939.

This is an excellent review of the clinical phases of leukocytic activity. The various forms of white blood cells and the changes that they present in the various states of disease are clearly classified and illustrated.

JAHR, Omaha.

EFFECT OF VITAMIN K ON THE CLOTTING TIME OF THE PROTHROMBIN AND THE BLOOD. W. W. WADDELL and DUPONT GUERRY III, J. A. M. A. **112**:2259 (June 3) 1939.

Determinations of the blood clotting time and the prothrombin clotting time were made during the neonatal period in the cases of 10 untreated infants. There was great variation, ranging from one-half to six and one-half minutes for prothrombin and two to ten minutes for blood, and in some cases there was pronounced retardation between the second and third day (six to ten minutes, respectively).

This localized abnormality suggests a relation to hemorrhagic disease, which frequently occurs also during the neonatal period.

In the cases of 10 treated infants a remarkably constant low value was noted after administration of a vitamin K concentrate. The clotting time for prothrombin never rose above thiry seconds or that for blood above three minutes.

The impression of the authors is that spontaneous hemorrhage in the newborn certainly should be benefited by administration of vitamin K. This treatment should reduce the mortality from intracranial hemorrhage.

HEERSMA, Kalamazoo, Mich.

SYNDROME OF CONSTRICTING DOUBLE AORTIC ARCH IN INFANCY: REPORT OF A CASE. IRVING J. WOLMAN, J. Pediat. **14**:527 (April) 1939.

A case of double aortic arch constricting the trachea and esophagus is described, together with 6 others collected from the literature. In every instance the symptoms were mild or absent at birth but became progressively more marked as time went on and led to death before the age of 6 months. In none was the correct diagnosis made. In all cases there were more or less characteristic symptoms: stridorous breathing, dysphagia, chronic cough, retraction of the head, malnutrition and susceptibility to bronchopneumonia. The most distinctive symptom was an increase in respiratory distress during feeding.

RAUH, Cincinnati.

CHRONIC CONSTRICTIVE PERICARDITIS. JOHN B. HUNTER and TERENCE EAST, Lancet **1**:255 (Feb. 4) 1939.

A new surgical approach for pericardiolysis is described.

LANGMANN, New York.

CARDIOMEGALY IN AN INFANT: IDIOPATHIC. REGINALD LIGHTWOOD and DONALD COURT, Proc. Roy. Soc. Med. **32**:316 (Feb.) 1939.

The case of a girl aged 9 months is reported. In the first week of life she had a cough, which continued. At the age of 4 months she was taken to the hospital on account of the cough. At that time clinical examination showed slight enlargement of the heart, which was confirmed by roentgen examination. The progress of the patient was followed, and roentgenograms taken at intervals showed that the cardiomegaly had been increasing. The child had progressed well and had no symptoms except the cough. All investigations gave negative results. A discussion follows concerning the underlying pathologic process. A postscript states that after three months the patient has remained in good health, and skiagrams show that the cardiomegaly is regressing.

WILLIAMSON, New Orleans.

MYELOID LEUKEMIA. C. ELAINE FIELD, Proc. Roy. Soc. Med. **32**:604 (April) 1939.

The case of a boy aged 7 months is reported. A full physical examination and investigations with detailed examination of the blood are reported. In the comment which concludes the paper the author points out facts to demonstrate the difficulties which arise in the differential diagnosis of von Jaksch's syndrome and leukemias in their early stages.

WILLIAMSON, New Orleans.

HEMATOLOGIC STUDIES IN NUTRITION: MILK ANEMIA OF THE YOUNG. J. M. LATSKY, South African M. J. **13**:461 (July 8) 1939.

After a comprehensive review of nutritional anemia, Latsky presents the results of his studies on this condition in young albino rats. He concludes that pure iron alone cannot cause satisfactory formation of hemoglobin when there is deficiency in both iron and copper and that nutritional anemia will satisfactorily respond to iron treatment only in the presence of bodily stores of copper. Addition of copper only to the anemia-producing diet resulted in a temporary rise in the level of hemoglobin, which soon afterward fell back to the previous anemic level. Administration of iron and copper resulted in (1) a dramatic response of general blood regeneration as compared to the insignificant response to iron therapy alone; (2) improvement in growth, health and general well-being of the animals to a more marked extent than after administration of iron alone and (3) a marked immediate reticulocytic response leading to a quick maturation of the erythrocytes.

In the animals fed iron and copper the sizes of the matured erythrocytes compared favorably with those of the most normal animal. Iron alone could not produce this marked hemoglobinization of erythrocytes. GONCE, Madison, Wis.

RETICULOENDOTHELIOSIS WITH APLASTIC ANEMIA IN AN INFANT. E. SCHWARZ, Med. ital. **20**:352 (July) 1939.

The author presents the case of a 3 month old infant ill for twenty days with an influenzal type of fever, rapid loss of weight, pallor, hemorrhagic cutaneous manifestations and subnormal temperature. There were intense pallor of the skin and mucous membranes and petechiae on the limbs, on the trunk and in the mouth. The spleen was palpable 3 fingerbreadths below the costal margin and of increased consistency; the liver was moderately enlarged. Death occurred on the thirtieth day of illness.

The urine gave a positive reaction for urobilin. The van den Bergh reaction was positive and indirect. The resistance of the cells was diminished. The red blood cell count decreased from 1,500,000 per cubic millimeter on admission to 700,000. There were moderate anisocytosis, poikilocytosis and complete absence of reticulocytes. The value for hemoglobin was 33 per cent (Sahli). The white blood cell count on admission was 6,000 per cubic millimeter. Later it fell to 3,000. A differential count showed: polymorphonuclears, 7 per cent; lymphocytes, 15 per cent; monocytes, 2 per cent, and histiocytes, large and small, 76 per cent. Autopsy and histologic examination confirmed the diagnosis. There was marked reticuloendothelial proliferation in the bone marrow, spleen and liver.

MARTOCCIO, Utica, N. Y.

VITAMIN C AND THE ABDOMINAL PURPURA OF SCHÖNLEIN-HENOCH. F. COPELLO, Riv. di clin. pediat. **37**:587 (July) 1939.

Ascorbic acid was of no practical clinical value in the case of Henoch's purpura reported. Ascorbic acid was much more rapidly excreted than normally, and dehydroascorbic acid was even more plentifully excreted than ascorbic acid. The high $\frac{D}{A}\frac{(\text{dehydroascorbic acid})}{(\text{ascorbic acid})}$ ratio of the urine indicated sympatheticotonia and an increased oxidation-reduction potential. The increased excretion was the probable reason for the lack of clinical benefit from ascorbic acid.

HIGGINS, Boston.

BLOOD GROUPS OF YOUNG DELINQUENTS IN CUBA. L. CASTELLANOS and J. A. D. PADRON, Vido nueva **43**:339 (June 15) 1939.

In 1926 Bohmer showed that among criminals the percentage of persons with blood of group B is considerably above normal. His work has been substantiated by many other investigations. Still other workers have shown a diminution in the percentage of delinquents whose blood belongs to group A. The authors of the present paper studied the blood groups of 275 inmates of a Cuban reform school and felt that their results were in line with those described in the preceding reports. They appreciate, however, that their series is small and of little statistical significance. Further studies will be published. DIETRICH, Beverly Hills, Calif.

COLORIMETRIC DETERMINATION OF THE LEVEL OF BLOOD CHOLESTEROL. B. BRAIER and A. CHOUELA, Rev. Soc. argent. de biol. **15**:45 (May) 1939.

A colorimetric method for determination of the concentration of cholesterol in blood, serum or plasma is presented. The procedure requires only forty minutes

and is applicable to very small amounts (0.2 to 0.3 cc.) of blood. The results compare favorably with those obtained with some of the more complicated methods now in use.

DIETRICH, Beverly Hills, Calif.

VARIATIONS IN PLASMA POTASSIUM FOLLOWING BLEEDING AND TRANSFUSION. J. L. MOGLIA, Rev. Soc. argent. de biol. **15**:82 (May) 1939.

Working with dogs, the author shows that when the animals are bled abruptly and sufficiently (2 to 4 per cent of the body weight) to reduce arterial pressure, the potassium content of the plasma rises rapidly. When the blood volume and pressure are restored by transfusion, the level of potassium falls. The reciprocal relation between blood pressure and potassium concentration is discussed. When the experiments were performed on adrenalectomized animals the results were inconstant. Generally, however, the changes were much less marked.

DIETRICH, Beverly Hills, Calif.

CONSTITUTIONAL AND ACQUIRED HEMOLYTIC ICTERUS. L. HEILMEYER, Med. Klin. **36**:201 (Feb. 17) 1939.

The clinical picture of familial hemolytic icterus is discussed in detail, and constitutional aberrations are mentioned. Splenectomy is not always indicated. Children showing general developmental retardation respond amazingly to splenectomy.

Acquired hemolytic icterus may follow septic infection, malaria or syphilis. Since it may disappear spontaneously, splenectomy should be deferred. In acquired hemolytic icterus, in contrast to the familial condition, splenectomy is followed by a return to normal of the blood picture.

SIEMSEN, Chicago.

REACTION OF THE BLOOD PRESSURE TO EPINEPHRINE DURING THE FIRST PERIOD OF LIFE. GUENTHER THIELE, Ztschr. f. Kreislaufforsch. **31**:137 (March) 1939.

In experiments on young dogs it was proved that in the newborn animal only a slight rise in the blood pressure is caused even by maximal doses of epinephrine. The reaction to epinephrine rises during the first weeks of life; it reaches its full height in dogs 4 months of age.

ARON, Chicago.

A SIMPLE MICROMETHOD FOR THE DETERMINATION OF ERYTHROCYTE SEDIMENTATION RATE IN CHILDREN. C. Y. WANG and F. T. CHU, Chinese M. J. **55**:220 (March) 1939.

The authors in the pediatric division of Peiping Union Medical College found certain disadvantages in five reported methods for determination of the sedimentation rate, so they have been trying a device of their own which has proved to be satisfactory. Only 0.1 cc. of blood is needed; this is obtained with no squeezing of the skin. Heparin, which does not influence the volume of the plasma nor change the size of the erythrocytes, is used as the anticoagulant. The pipets are kept in the vertical position, and the temperature remains favorable because of the large volume of water in the jar. The water is kept at 23 C. These conditions add to the accuracy of the test. The pipets serve both for hematocrit readings and for determination of the sedimentation rate. The instruments and technic are described in detail and with illustrations. The authors publish tables of normal values for the different age periods up to 12 years. For 90 healthy children under 12 years of age, the rates as determined by the micromethod were between 0.5 and 17 mm., but figures between 15 and 17 are borderline values. The authors found that it is not necessary to make corrections of the rate in cases of anemia. With healthy children the cell count is apt to remain relatively stable, regardless of fluctuation in the hemoglobin content and cell volume.

NEFF, Kansas City, Mo.

LYMPHOCYTOPENIA AND FEVER. FREDRICK SUNDELIN, Acta med. Scandinav. **99**:563 (April 26) 1939.

In cases of fever induced by Bacillus coli, chancre, gonococci vaccines, or injections of sulfur, induced malaria and (1 case) of sepsis, a definite fall in the lymphocyte count was found, which closely coincided with the peak of temperature and returned to normal in about twenty-four hours, when the temperature became normal again. The total white cell count usually showed an increase at the same time.

Similarly, injections of salts or heavy metals caused a decrease of lymphocytes and caused the temperature to rise to 39 C.

No explanation is offered for the observations. KAJDI, Baltimore.

SULFANILAMIDE GRANULOCYTOPENIA. HELGE MYKRE, Acta med. Scandinav. **99**: 614 (April 26) 1939.

The author collected 25 cases of sulfanilamide granulocytopenia from the literature and added 1 case of his own. Fifteen of the patients died. The author's patient was treated for pyuria and received a total of 18.9 Gm. of the drug in twenty-two days. The temperature rose above 39 C. The segmented and juvenile forms of granulocytes disappeared from the circulating blood and from the sternal bone marrow. The total white cell count was 2,220 per cubic millimeter. Basophilic stippling of the red blood cells was marked. When the drug was discontinued and liver extract therapy instituted the peripheral blood returned to normal in six days, but marked improvement in the bone marrow was noted in two days. Basophilic stippling persisted for eight weeks. KAJDI, Baltimore.

Diseases of Nose, Throat and Ear

THE PROBLEM OF THE HARD OF HEARING SCHOOL CHILD. J. C. GEIGER, F. H. RODIN and B. A. CHASE, Arch. Pediat. **56**:605 (Sept.) 1939.

Over a period of ten years, three surveys were conducted on the hearing of the San Francisco school children. The survey was carried on in all the schools, and the hearing of children from grade 4 up to and including the high schools was tested. A 4-A audiometer was used in conducting the tests. When a borderline condition was encountered, the hearing was retested with a 2-A audiometer. The 2-A audiometer was also used to detect any change in the hearing after treatment and to follow up the progress of a defect in hearing. Over 86,000 children were examined.

A total of 36,191 children were examined during the first survey. On the retest, 3,427 had a loss of hearing of 9.0 or more per cent in the better ear—9.5 per cent of all the children under survey. The second survey, conducted five years later, included a total of 30,713 children. On the retest 2,538 had a loss of 9.0 or more per cent in the better ear—8.3 per cent of all the children under survey. After a period of five years the third survey was conducted, and a total of 19,627 children were examined. On the retest 1,433 children had a loss of 9.0 or more per cent in the better ear—7.3 per cent of the total number under survey. During the ten year period the number of children that had a loss of 9.0 or more per cent of their hearing dropped from 9.5 per cent to 7.3 per cent of all the children whose hearing was tested.

During the ten year period a marked reduction in the number of children with discharging ears occurred. In the first survey, 0.5 per cent had discharging ears, while only 0.15 per cent had auricular manifestations in the last survey. In the first survey 355 children, or 1.0 per cent of all the children considered, had enlarged or infected tonsils associated with their defect in hearing. In the last survey 52 children, or 0.3 per cent of all children tested, showed abnormal tonsils with some hearing defect.

The reduction in the incidence of communicable diseases, with their many complications involving the ear, has reduced the incidence of loss of hearing. The early recognition of otitic complications and the prompt attention to such conditions have been important factors in reducing defects of hearing.

ORR, Buffalo.

SULFANILAMIDE IN THE TREATMENT OF OTITIS MEDIA. G. E. FISHER, J. A. M. A. **112**:2271 (June 3) 1939.

Fisher reports striking results from the use of sulfanilamide in the treatment of acute otitis media due to the beta hemolytic streptococcus. In 95 cases sulfanilamide was not given, while in 88 cases it was given with an equal amount of sodium bicarbonate. In all these cases the red protruding drum membrane was incised, or, when spontaneous perforation took place, incision to enlarge the opening was performed in order to promote drainage. The number of patients receiving sulfanilamide and of those not receiving it were about equal for each month. No seasonal variations or difference due to the virulence of the infecting organism is apparent in this series. The months of December, January, February and March showed a larger incidence of aural suppuration.

The actual difference in treatment in the cases in this series is merely the use of sulfanilamide in one group and not in the other, and because of the care with which the study was conducted the results speak emphatically for themselves.

Of the 95 patients on whom myringotomy was performed but to whom sulfanilamide was not given, 66 required mastoidectomy, whereas of the 88 patients on whom this operation was performed and who were given sulfanilamide, only 7 required mastoidectomy. Four of the group not receiving sulfanilamide had septicemia; 3 of these recovered after operation, and 1 died.

No complications arose in the group of 88 patients who received sulfanilamide. The average duration of otorrhea for 95 patients who did not receive sulfanilamide was sixty-five days, while the otorrhea of the 88 patients who were given sulfanilamide lasted on the average twenty-three days.

The author has found 10 grains (0.65 Gm.) of the drug (with an equal part of sodium bicarbonate) three times daily for the first four days and 5 grains (0.32 Gm.) three times daily thereafter safe and effective.

The toxic symptoms that should be looked for and the undesirable effects of the drug are as follows: (1) increasing weakness and lassitude; (2) loss of appetite; (3) nausea and vomiting; (4) fever, which decreases when the drug is withdrawn and increases when its administration is begun again; (5) a progressive fall in hemoglobin; (6) dermatitis, especially of the exfoliative type; (7) severe hemolytic anemia with jaundice, at the appearance of which administration of the drug should be discontinued and a transfusion given, and (8) agranulocytosis.

When any of the first four symptoms appear, administration of the drug should be reduced or discontinued entirely. When any of the last four symptoms appear, administration should be discontinued at once.

GORDON, Philadelphia. [ARCH. OTOLARYNG.]

PHYSIOTHERAPY IN THE COMMON COLD AND SINUSITIS. W. K. RUSSELL, Brit. J. Phys. Med. **2**:92 (April) 1939.

Russell stresses the importance of ultraviolet irradiation in the prevention of colds and the local use of ultrashort wave therapy in the treatment of colds and sinusitis. His statistical evidence was obtained from other workers.

HARTMAN, Cleveland.

TWO CASES OF FATAL CONGENITAL STRIDOR IN A FAMILY. M. NAGEOTTE-WILBOUCHEWITCH, Bull. Soc. pédiat. de Paris **37**:85 (Feb.) 1939.

Two members of a family of 8 children died in infancy of bronchopneumonia. Both had laryngeal stridor, brassy cough and occasional vomiting. Roentgeno-

grams revealed nothing in the chest to account for the stridor, and bronchoscopic examinations showed no abnormality in or above the larynx. It is thought some tracheobronchoesophageal anomaly was present. No autopsies were performed.

BENJAMIN, Montreal, Canada.

A CASE OF PROBABLE NASOMAXILLARY LUPOSYPHILITIC HYDRIDISM. G. SAIBENE, Arch. ital. di otol. **51**:201 (April) 1939.

A girl aged 12 years had a destructive ulcerating lesion in the nasal vestibule, involving the bone of the septum and the maxilla. The preliminary diagnosis was lupus. Appropriate treatment being inefficacious, syphilis was suspected and a Wassermann test gave a positive result. Antisyphilitic medication was followed by prompt and rapid recovery.

The author discusses at length the etiologic diagnosis. In favor of lupus were the hypertrophic vegetating character of the ulceration, with rosy gray nodules, and the discovery in the biopsy material of tuberculous granuloma and acid-fast bacilli. The deep-seated involvement of the bone and the prompt improvement following antisyphilitic treatment indicated syphilitic participation. The failure of the patient to react to the tuberculin test does not invalidate the diagnosis of lupus, since it has been shown by Tarentelli and others that anergia to tuberculin may be present in patients with late syphilitic manifestations and a strongly positive Wassermann reaction. The improvement in the tuberculous element in the lesion along with that in the syphilitic component is explained by the increase in general bodily resistance induced by the antisyphilitic treatment.

DENNIS, San Diego, Calif. [ARCH. OTOLARYNG.]

Diseases of Lungs, Pleura and Mediastinum

FACTORS AFFECTING POSTNATAL GROWTH OF THE LUNG. R. COHEN, Anat. Rec. **75**:195 (Oct.) 1939.

In the growing rat the lung weight is proportional to the body weight. If either a small or a large part of the lung is removed, the restitution of lung is proportional to the body weight, and after a period of two weeks the lungs weigh the same as those of a normal rat of that size. Stretching of lung tissue increases the weight, whereas interfering with expansion reduces the increase in weight of lung in the growing rat and particularly after lobectomy. The younger the animal the more rapid is the rate of restitution. The increase in lung weight is a response to a mechanical stimulus.

SNELLING, Toronto, Canada.

GASTROINTESTINAL SYMPTOMS OF RESPIRATORY INFECTIONS. J. F. CAREY, Illinois M. J. **76**:325 (Oct.) 1939.

Carey points out that although the symptom complex in children is frequently gastrointestinal, the pathologic condition is still in the upper respiratory tract. Pain in the abdomen is caused more often by infections of the upper respiratory tract than by all other causes combined. Conservatism and frequent observations during the questionable stage are essential. These points are elaborated on in the discussion.

BARBOUR, Peoria, Ill.

PNEUMONIA IN CHILDHOOD. W. M. WHITAKER, Illinois M. J. **76**:426 (Nov.) 1939.

This comprehensive article on the causes, the classification and the chemotherapy and serotherapy of the pneumonias of childhood is too detailed for satisfactory abstracting.

BARBOUR, Peoria, Ill.

A Review of One Hundred and Twenty Cases of Bronchiectasis in Children in New South Wales. C. Selby, M. J. Australia **2**:352 (Sept. 2) 1939.

The average age of the children with bronchiectasis was 7 years. There was a preponderance of females—74 : 46. The usual physical signs were present in all, but the general appearance did not suggest chronic ill health. There were no significant bacteriologic findings. The involvement of lung tissue was mostly in the bases; in 52 per cent it was bilateral.

Whooping cough was the most common antecedent infection.

In regard to treatment, prophylaxis through the prevention of measles, whooping cough and other diseases is stressed. The treatment of the actual condition calls for roentgen study with the help of iodized poppyseed oil 40 per cent and a thorough search for septic foci elsewhere. Bronchoscopic and postural drainage is important. Radical surgical procedures are reserved only for intractible bronchiectasis.

The prognosis does not seem to be as grave in Australia as in other countries.

Tenney, Madison, Wis.

Roentgen Studies of Infantile Asthma. R. Debré, M. Lamy, M. Mignon and J. Nick, Presse méd. **47**:957 (June 17) 1939.

The authors consider roentgen studies of great value in proving the diagnosis of asthma. They present a series of 36 cases. The patients were studied during intervals of remission as well as during attacks. The importance of using the proper technic is stressed. The patient should be in the upright position; the plates should be taken during inspiration, and a fluoroscopic examination should be made. During the attack four definite changes occur: (1) the thoracic cage is enlarged, generally symmetrically, with spreading of the ribs, (2) the diaphragm is lowered and loses its domed shape, (3) the hilus shadows are lengthened, especially vertically, and (4) the lung parenchyma becomes more transparent, representing a sort of acute emphysema. These changes disappear as the attack subsides. With repeated attacks, however, the changes become permanent.

Daffinee, Boston.

Intravenous Vaccine Therapy of Bronchopneumonia in Infants. E. Comolli, Med. ital. **20**:240 (May 31) 1939.

Comolli treated 42 infants having bronchopneumonia by injecting a vaccine intravenously. The vaccine consisted of streptococci, staphylococci, pneumococci, colon bacilli and Bacillus pyocyaneus. The initial dose of vaccine was from 0.2 to 0.5 cc.; sometimes for the third injection 1.5 cc. was given; exceptionally the amount was 2.0 cc. The vaccine was administered every other day. The largest number of doses given was only four. The author did not take into account whether the disease was primary or secondary. Four of the patients were 2 years of age or over. Seven patients died, and 35 recovered. The duration of the disease was not more than eight days in 21 patients, not more than ten days in 10, and eleven, eleven, twelve and thirteen days, respectively, in 4 patients. Almost constantly after four to six hours (sometimes after twelve hours) there was a drop of temperature to an almost normal and even to a subnormal level. Recovery generally occurred after the second or the third injection (in only 2 patients after the fourth). After the fall in temperature the child appeared improved.

Martoccio, Utica, N. Y.

Breath Holding. A. Peiper, Monatschr. f. Kinderh. **79**:236 (Aug.) 1939.

Peiper shows respiratory tracings demonstrating that in breath holding the pause in breathing comes at the end of an expiration and is relieved by inspiration. The spell lasts about half a minute.

Gerstley, Chicago.

PSEUDOCAVITIES IN PNEUMONIA DURING CHILDHOOD. H. WISSLER, Röntgenpraxis **11**:209 (April) 1939.

As long ago as 1930 Kleinschmidt recognized that lobar pneumonia in children is occasionally followed by the appearance of sharply demarcated annular shadows of negative density, the roentgen features of which render them virtually indistinguishable from those of lung abscess but which are not accompanied by the physical signs or the clinical features of this dreaded complication and which disappear uneventfully after a short space of time. Aware that these did not represent true excavation of the lung, he termed them "pseudocavities." Although roentgenologists with a clientele of children have become familiar with the phenomenon, it continues to give rise to much diagnostic confusion on the part of those who confine their attention to adults. Because of lack of postmortem observations, uncertainty prevails with regard to the production of these shadows. It is clear that they do not represent loss of lung substance with pulmonary excavation. They have been called cysts, pneumatoceles and localized, presumably interlobar pneumothorax; the best evidence suggests that they are ascribable to localized pulmonary emphysema that develops in the course of the irregular softening of a consolidated lung.

The report concerns a 6 year old child whose roentgen film showed the classic picture. Tomographic examination led an experienced roentgenologist of adults to defend the diagnosis of pulmonary excavation with the ejaculation, "If this is not a cavity, then our whole diagnosis of tuberculous cavitation is wrong." None the less, the pseudocavity, which was recognized ten days after the crisis in typical lobar pneumonia, faded uneventfully in less than three weeks.

McCUNE, New York.

INVESTIGATIONS ON THE PNEUMONIA DIAGNOSIS IN EARLY CHILDHOOD WITH SPECIAL REFERENCE TO SEROTHERAPY. C. FRIDERICHSEN, Acta pædiat. **24**:165, 1939.

This paper is based on 87 cases of pneumonia that were observed in the Sundby Hospital, Copenhagen, between January 1937 and January 1938. The cases are discussed from the roentgenographic and bacteriologic points of view. The advantages derived from serotherapy appeared to be negligible.

McCUNE, New York.

VALVULAR STENOSIS IN CHILDREN. M. DE BRUIN and P. G. GERLINGS, Nederl. tijdschr. v. geneesk. **83**:3310 (July 1) 1939.

Five cases of valvular stenosis in children of 1½ to 2½ years are described. The valvular obstruction of the bronchi involved whole lungs in some of the cases and separate lobes in others. The clinical and roentgenologic findings are commented on in detail. Special stress is laid on the fact that in cases of aspiration of a foreign body overfilling of an area of the lung with air must not always be explained by complementary dilatation resulting from collapse of an adjacent sector of the lung. Often this overfilling results from valvular obstruction. Finally the significance of local bronchitis in the causation of valvular obstruction or atelectasis is shown.

VAN CREVELD, Amsterdam, Netherlands.

PURULENT PULMONARY CYST, TREATED BY LOBECTOMY. H. W. HOEFNAGELS, Nederl. tijdschr. v. geneesk. **83**:3598 (July 15) 1939.

A pulmonary cyst in a girl of 14 years was treated by lobectomy. The literature is reviewed with reference to the clinical picture, genesis and treatment of pulmonary cyst.

VAN CREVELD, Amsterdam, Netherlands.

TREATMENT OF BRONCHIAL ASTHMA. C. L. DE JONGH, Nederl. tijdschr. v. geneesk. **83**:4649 (Sept. 23) 1939.

A few points are discussed concerning the treatment of bronchial asthma. Evidence is brought forward in favor of the view that mental factors play an important part in the causation and in the elimination of the symptoms of this disease.

VAN CREVELD, Amsterdam, Netherlands.

Diseases of the Gastro-Intestinal Tract, Liver and Peritoneum

REVIEW OF LITERATURE ON MESENTERIC ADENITIS. J. M. EMMETT, M. FLIESS and F. H. YORKOFF, Virginia M. Monthly **66**:105 (Feb.) 1939.

After reviewing the literature and reporting the findings in 35 cases observed by them in a ten year period, the authors reached the following conclusions:

1. Mesenteric lymphadenitis is diagnosed in many cases at operation.
2. In cases of acute abdominal diseases in children it is advisable to operate.
3. In half of the cases mesenteric adenitis is associated with an infection of the upper respiratory tract.
4. The incidence of the condition is greater in winter than at any other time of the year.
5. The disease is primarily one of young persons.

STONE, Richmond, Va.

A STATISTICAL NOTE ON GASTRO-INTESTINAL DISORDERS IN INFANTS. M. D. BABER, Arch. Dis. Childhood **14**:40 (March) 1939.

This is a report of the cases of 1,993 children under 1 year of age admitted to Adler Hey Childrens Hospital, Liverpool, England, during 1937. They were divided into nine groups:

I. Gastrointestinal disorders	539 cases
II. Respiratory disorders	643 cases
III. Prematurity	33 cases
IV. Congenital abnormalities	53 cases
V. Congenital pyloric stenosis	15 cases
VI. Otitis and mastoiditis	197 cases
VII. Surgical conditions	241 cases
VIII. Infectious diseases	105 cases
IX. Other diseases	167 cases
Total	1,993 cases

Group I is discussed in detail. Feeding histories were carefully scrutinized and diets of infants under the age of 1 year were found to be, in general, unsatisfactory. In 189 cases there was diarrhea associated with parenteral infections, with a death rate of 50 per cent.

KELLY, Milwaukee.

THE APPLE TREATMENT OF INFANTILE DIARRHOEA. WILFRID SHELDON and MARCIA HALL, Arch. Dis. Childhood **14**:43 (March) 1939.

The effect of a diet of raw apple pulp and weak tea has been studied in 36 infants suffering from diarrhea. The age of the infants ranged from 9 weeks to 2 years (that of the majority, between 6 and 15 months). Although the treatment is in no sense specific and does not replace other methods, it may be employed as a valuable adjunct. The best results are observed in infants with persistent diarrhea associated with the passage of frequent loose, offensive stools. The most noticeable effects are lessening of toxemia, improvement in the stools and rapid and sustained rise in weight.

KELLY, Milwaukee.

THE ASSOCIATION OF GALL-STONES WITH ACHOLURIC JAUNDICE IN CHILDREN. R. S. ILLINGWORTH, Arch. Dis. Childhood **14**:109 (June) 1939.

Gallstones are probably more commonly associated with acholuric jaundice in children than is generally recognized. The presenting symptoms in such cases may be due to the gallstones. Diagnosis is simple, as the pigment stones are radiopaque. A case is described which illustrates these points. Microspherocytosis disappeared soon after a crisis; fragility was persistently raised. The significance of these facts is discussed. Blood transfusion for acholuric jaundice is discussed and is said to be clinically beneficial. Severe crises of acholuric jaundice tend to resemble those of Lederer's anemia. The differential diagnosis is discussed.

KELLY, Milwaukee.

RECURRENT INTUSSUSCEPTION IN A YOUNG CHILD. IAN FRASER, Lancet **1**:874 (April 15) 1939.

Intussusception occurred on four occasions in a child between the ages of 8 and 26 months. On the first, second and fourth occasion the intussusception was of the usual ileocecal variety; on the third it was enteric.

LANGMANN, New York.

INFANTILE DIARRHEA. J. M. SMELLIE, Lancet **1**:969 (April 29); 1026 (May 6) 1939.

The syndrome known variously as infantile diarrhea, acute diarrhea with vomiting and acute intoxication is a frequent and serious disorder of infancy and early childhood. An analysis of 500 cases observed in the Children's Hospital, Birmingham, England, during the last few years showed that it is essentially a disease of the early months of life and that it is commonest in the artificially fed. In 46.2 per cent of cases there was parenteral infection at the time of admission, and the mortality in this group was 56.3 per cent. No parenteral infection was present at any time in 30.3 per cent, and this group showed a mortality of only 11.3 per cent.

In the treatment of this disease the correction of dehydration (by administration of fluid by mouth and by subcutaneous and intravenous injection) is the most important measure. After an initial starvation period of twelve to twenty-four hours, feeding should be begun, at first with feedings low in fat but with full protein and liberal and mixed carbohydrate content.

LANGMANN, New York.

PNEUMOCOCCIC PERITONITIS IN CHILDREN. STANLEY WILLIAMS, M. J. Australia **1**:506 (April 1) 1939.

This condition must be kept in mind in the differential diagnosis of acute appendicitis, particularly with girls who are very ill soon after onset. A review of 45 cases in a ten year period in the hospital in Melbourne, Australia, showed that in 31 the condition was probably primary, while in the remainder it was secondary to infections of the lungs or ears. That pelvic infection is the probable mode of entrance is seen from the preponderance of female patients, and observations show that pelvic infection was present in about half. However, it has been noted that pneumococci can be cultured from "female smears" in the cases of some children who show no evidence of peritonitis. The age incidence ranged from 1 to 11 years, the preponderance being at 4 years. The onset was always abrupt, as was shown by the fact that half the children were admitted to the hospital within twenty-four hours. For diagnosis in cases of acute involvement, bacteriologic examination of abdominal fluid is necessary, but as the symptoms are so similar to those of acute appendicitis delay in surgical intervention is seldom justified. Conservative treatment with sulfapyridine may be tried, but operative drainage is usually necessary.

TENNEY, Madison, Wis.

CROHN'S DISEASE. J. C. B. ALLEN, M. J. Australia **1**:831 (June 3) 1939.

Two cases of Crohn's disease (regional ileitis) are reported, illustrating the acute phase of the disease in two distinct localizations. In neither case was the diagnosis made prior to operation. In both conservative treatment was adopted and appears up to the present to have been justified. The clinical features of the disease are briefly discussed.

GONCE, Madison, Wis.

CONGENITAL STEATORRHEA WITH CONGENITAL MORBUS CORDIS. C. HARDWICK, Proc. Roy. Soc. Med. **32**:319 (Feb.) 1939.

A boy aged 5½ years was taken to the hospital on account of persistent diarrhea which had been noticed since the age of 2 years. There were six to seven large, pale, greasy stools a day, and at times oily drops were passed. The boy's appetite was enormous. There was a systolic murmur, maximal at the apex. The apical beat was palpable in the fourth space in the nipple line. There were no thrills, and there was clubbing of the fingers. A full history and results of physical examination and all investigations, including examination of the stools, are given in detail.

WILLIAMSON, New Orleans.

HIRSCHSPRUNG'S DISEASE TREATED WITH SYMPATHECTOMY. T. MEYRICK THOMAS and W. M. FELDMAN, Proc. Roy. Soc. Med. **32**:330 (Feb.) 1939.

The case of a boy aged 12 years is reported.

WILLIAMSON, New Orleans.

CONGENITAL MALFORMATIONS OF THE SMALL INTESTINE. C. TEDESCO, Lattante **10**:55 (Feb.) 1939.

Two cases of newborn infants with atresia of the duodenum are reported. In 1 there was atresia at the duodenojejunal junction; the liver and pancreas with their ducts and blood supply were normal. In the other there were multiple malformations (of the bones, urinary tract, rectum, pancreas and duodenum); the pancreas was large and polycystic and pressed on the duodenum to cause the atresia and the whole small bowel was only 33 cm. long.

Congenital atresia of the duodenum is to be traced to an abnormal position either of the pancreas or of the liver with pressure on the duodenum or to an inherent incapacity of the bowel to grow and evolve into a patent tube.

HIGGINS, Boston.

HEPATIC INSUFFICIENCY IN CHILDREN. V. PECHERE, Med. inf., Rome **10**:93 (April) 1939.

Children with dysfunction of the liver appear toxic, have poor color and circles under the eyes and are nervous and disinclined to play. Headaches, transitory fever, loss of appetite, especially for fatty foods, and constipation, with foul, poorly colored stools, are present. Such children are particularly subject to colds and abdominal pains. Physical examination of the liver may reveal no abnormality.

Treatment is largely dietary. Vegetables and fruit form the main articles of the diet; butter, meat, and fish are excluded; skimmed milk, fresh cheese and eggs in moderation may be taken.

HIGGINS, Boston.

CHEMISTRY OF THE GASTRIC JUICE IN ACUTE AND CHRONIC DISEASES OF NUTRITION. A. RACUGNO, Riv. di clin. pediat. **37**:265 (March) 1939.

Observations were made on the gastric contents of 9 infants with acute alimentary intoxications and on 12 with persistent failure to gain in weight (hypotrophy). In the former group the tendency was toward hyperacidity and normal peptic enzymes. In the latter group the tendency was toward hypochlorhydria, but with normal peptic enzyme activity.

HIGGINS, Boston.

CELIAC DISEASE. F. COPELLO, Riv. di clin. pediat. **37**:726 (Aug.) 1939.

This article consists of a review of the literature on celiac disease.

HIGGINS, Boston.

INTESTINAL OCCLUSION BY ABSCESS OF THE SAC OF DOUGLAS. R. GARCIA MONTENEGRO, Arch. de med. inf. **8**:239 (Sept.) 1939.

This condition occurred in a 6 year old child. Recovery followed operation.

SANFORD, Chicago.

TREATMENT OF DYSENTERY IN CHILDHOOD WITH BACTERIOPHAGE. H. SEIDLMAYER, Ztschr. f. Kinderh. **60**:579 (Feb. 18) 1939.

Seventy-one cases of dysentery were treated at the University of Munich Children's Clinic during 1936, 1937 and 1938. Cultures of the stool in 68 showed Kruse-Sonne bacilli; in 2, Hiss-Russel bacilli. The stools consisted mainly of pus and mucus. In only 22.5 per cent did blood occur. Twenty-seven children were treated with bacteriophage and 34 without. Bacteriophage was given mainly by mouth and preceded by alkali medication because of the sensitivity of phage to an acid medium. In the cases of patients treated with phage, cultures of the stool were sterile on the average after seven and six-tenths days (control cases, twelve and five-tenths days) and stools were normal after an average of nine days (control cases, nineteen and one-tenth days). Seven of 9 toxic patients were treated with phage; 3 of these died. The 2 patients treated without phage died.

In a few cases of dysentery accompanied by encephalitis dysentery serum had a decidedly beneficial effect.

SIEMSEN, Chicago.

INTUSSUSCEPTION IN ADULTS. C. S. HUANG, Chinese M. J. **55**:514 (June) 1939.

Although intussusception is primarily a disease of childhood, a report from India in 1932 showed predominance of the condition in adults. Huang, of Shanghai, does not find this to be the case in China, where the ratio is 3 children to 1 adult. However, the prognosis for adults is not so bad. There have been 2 deaths among his 8 adult patients, death following resection of the intestine.

NEFF, Kansas City, Mo.

Nervous Diseases

SURVIVAL OF THE VIRUS OF ST. LOUIS ENCEPHALITIS IN RATS AND GUINEA PIGS. M. G. SMITH, J. Infect. Dis. **64**:207 (May-June) 1939.

Smith shows that the virus of St. Louis encephalitis could not be transferred after the first passage, although it might be found in the brains of rats and guinea pigs for eight or nine days after their inoculation with infected mouse brain.

TOOMEY, Cleveland.

EQUINE ENCEPHALOMYELITIS IN MAN: REPORT OF THREE QUESTIONABLE CASES. B. F. JOHNSON and L. M. MORSE, Wisconsin M. J. **38**:464 (June) 1939.

Equine encephalomyelitis since its appearance was first noted in California, in 1930, has steadily increased. It is now widespread, and during the fall of 1938 there were 7,289 animals reported to have it in Wisconsin. Of these, 1,538 died. The possibility of its transmission to man must be considered. Three cases are briefly given. The patients were children aged 3 to 5 years. They lived on or near farms where there were horses with encephalomyelitis. Severe illnesses

developed in them, neurologic in nature, which resulted in the death of 2 of them. The symptoms were fever, headache, dizziness, convulsions, twitchings and cyanosis. Rigidity of the neck was observed in 2. The spinal fluid showed up to 105 cells per field. The blood serum, tested with strains of eastern, western and St. Louis encephalomyelitis, showed no neutralizing antibodies for any of these strains. Autopsy showed only edema, passive congestion and lymphadenopathy, and the causes of death remained undetermined. The possible relationship to the equine disease must be kept in mind. JANNEY, Wauwatosa, Wis.

MENINGOCOCCIC MENINGITIS WITH MENINGOCOCCEMIA TREATED SUCCESSFULLY WITH SULFANILAMIDE. P. DECOUNT, R. MARTIN, HERAULT and PANTHIER, Arch. de méd. d. enf. **42**:367 (June) 1939.

Therapeusis with sulfanilamide and its derivatives seems particularly satisfactory in localized streptococcic diseases of the skin, such as erysipelas, and in meningitis. It has led Robert Debré to inquire whether the embryologic character of these tissues may not explain this remarkable potency. The excellent results obtained in streptococcic invasions are duplicated through the use of sulfanilamide in meningococcic inflammations. The authors report a case. A boy of 13 with meningitis was promptly relieved of all symptoms within two weeks by moderate doses of sulfanilamide. Three weeks later he was admitted to the Pasteur Hospital suffering from meningococcemia. It was found necessary to increase the dose of the drug up to 3 Gm. in twenty-four hours before convalescence was established. Permanent cure followed. AMESSE, Denver.

CEREBROSPINAL MENINGITIS WITH PROLONGED CACHEXIA COMPLICATED BY BLINDNESS AND DEAFNESS; RECOVERY. P. LEREBOULLET, J. BERNARD and R. VILLEY, Arch. de méd. d. enf. **12**:371 (June) 1939.

The introduction of derivatives of sulfanilamide into the treatment of cerebrospinal meningitis has modified, without radically changing, the prognosis in this major affliction. An observation which illustrates this contention is reported by the writers. A baby 6 months of age was admitted to a hospital, June 11, 1938, with a history of fever, convergent strabismus and vomiting during the previous week. Spinal puncture on the day of entry showed a purulent fluid. Neurologic examination revealed the usual signs of meningeal irritation: a tense fontanel, rigidity of the neck and spine, strabismus and tache. The spinal fluid contained large numbers of polymorphonuclears with abundant extracellular meningococci. Ten cubic centimeters of polyvalent serum was immediately injected into the spinal canal, and 1.5 Gm. of sulfanilamide was given by mouth. This therapy was carried out daily from June 11 to June 17, without material change in the clinical picture. From June 18 to June 20, inclusive, sulfanilamide alone was administered in doses of 3 Gm. by mouth and 15 cc. of solution intrathecally. No visible improvement was noted, the baby remaining in a critical state. Maternal blood was injected intramuscularly, June 22, and the injection was repeated on alternate days. By June 29 the tempearture had returned to 37 C. (98.6 F.), and the patient was distinctly better, but there was extreme cachexia, and rigidity of the neck persisted to the point of definite opisthotonos. Careful examination also showed complete loss of vision and of hearing.

Radiotherapy, directed toward the cranial base, was begun. Sulfanilamide, 2 Gm. per day, was offered from July 8 to July 20, with no alteration in the clinical aspects except an arrest of the wasting process. Encouraged by the latter development, dextrose was added to the ration of breast milk, and 5 units of insulin was injected daily. The infant was discharged on July 28 but was followed at home. Its weight rapidly increased to normal for the age, and by November 12 sight and hearing were fully restored. AMESSE, Denver.

RECOVERY FROM OTOGENOUS MENINGITIS OF STREPTOCOCCIC ORIGIN FOLLOWING COMBINED SURGICAL AND SULFANILAMIDE TREATMENT. M. OMBRÉDANNE and A. PAPAIOANNOU, Arch. de méd. d. enf. **42**:376 (June) 1939.

A boy of 9½ years was seized with intense headache, accompanied by nausea and vomiting, after a day on the beach. He had been exposed to the sun after bathing. The temperature rose to 39.9 C. (103.8 F.) and was maintained around this point for three days. He was admitted to a hospital for treatment. Examination gave negative results with the exception of slight coryza and congestion of the pharynx; the boy was badly sunburned. Within twenty-four hours, however, the temperature had reached 40 C. (104 F.). The headache was insupportable, and Kernig's sign was present. Spinal fluid obtained by puncture was very cloudy and contained 1,700 cells, mostly polymorphonuclears, but was free of bacteria on direct examination. Culture revealed a streptococcus; a finding which was confirmed by a further withdrawal of spinal fluid rich in streptococci. Treatment with sulfanilamide was begun on the first day. Up to this time there had been no complaint of pain in the auricular or mastoid regions, but on the following day latent otitis media was discovered on the right side. Paracentesis resulted in escape of pus containing streptococci. Under treatment with large doses of sulfanilamide, the meningeal symptoms rapidly subsided and the spinal fluid became sterile in six days. Mastoiditis now developed, with complete deafness of the right ear. A roentgen examination was confirmatory. Mastoidectomy showed considerable osseous destruction. The administration of sulfanilamide was continued for fourteen days. Facial paralysis was noted on the thirteenth day, and the patient was operated on again. Complete recovery followed. AMESSE, Denver.

CONGENITAL SYSTEMIC DISEASE OF THE CENTRAL NERVOUS SYSTEM. C. DE LANGE, Ann. pædiat. **152**:309 (March) 1939.

De Lange reports the clinical history and the postmortem observations in a case of extrapyramidal disturbance of motility in which treatment with atropine was not very successful. The symptoms were caused by arrested development of the corpus striatum.

FROM AUTHOR'S SUMMARY.

FOOT GRIP REFLEX IN THE NEWBORN INFANT: ITS USE IN DIAGNOSIS. F. STIRNIMANN and W. STIRNIMANN, Ann. pædiat. **154**:249 (Feb.) 1940.

The grasp reflex of the foot has been tested in more than 1,000 newborn infants and nurslings; it was present in 98 per cent of them. If the response is absent or takes the form of fanning, probably some disturbance or malformation of the central nervous system is present. The minimal pressure that elicits the reflex is normally between 40 and 70 Gm., 30 and 80 Gm. being the limits. With higher or lower pressure, the greater the difference from the normal the more certain is the conclusion that the condition is pathologic.

The grasp reflex of the foot disappears when the child begins to walk; its reappearance is probably pathologic.

The grasp reflex of the foot is probably useful for diagnosis of abnormality in newborn infants and nurslings, especially in the case of birth injury and in that of tetany of the newborn.

FROM AUTHORS' SUMMARY.

POSTINFECTIOUS ENCEPHALITIS. J. BRODTMANN, Monatschr. f. Kinderh. **78**:162 (May) 1939.

This report is based on a study of 31 cases of encephalitis following measles, chickenpox, mumps and smallpox vaccination. The distribution of cases was as follows: measles, 14; chickenpox, 10; mumps, 3; vaccination, 11. There were 2 deaths each in the measles and chickenpox groups. The complete recoveries were

7 in the measles, 8 in the chickenpox, 3 in the mumps and 7 in the vaccination groups.

Brodtmann offers two hypotheses: 1. The encephalitis may result from virus still present in the nervous system. 2. The symptoms may result from scar formation.

GERSTLEY, Chicago.

A CASE OF PURULENT MENINGITIS ACCOMPANYING PETROSITIS, WITH OPERATION AFTER THE METHOD OF RAMADIER. P. G. GERLINGS, Nederl. tijdschr. v. geneesk. **83**:2463 (May 27) 1939.

A girl of 12 years with petrositis and purulent meningitis recovered after being operated on according to the method of Ramadier (1933). In performing this operation an abscess in the point of the petrous bone and probably also an extradural abscess were opened.

VAN CREVELD, Amsterdam, Netherlands.

TREATMENT OF EPILEPSY BY MEANS OF A KETOGENIC DIET. A. VERJAAL, Nederl. tijdschr. v. geneesk. **83**:2602 (June 3) 1939.

Verjaal is of the opinion that the theoretic basis of the success of the treatment of epilepsy by a ketogenic diet is not clear. Perhaps it must be sought in a general change in the biologic milieu. The treatment is impracticable in home surroundings and necessitates a stay of six to twelve months in a nursing home especially equipped for this treatment. Without regular control of the pulse and both qualitative and quantitative urinalysis for ketone bodies, urobilin, acidity and ammonia, the cure can be dangerous. From a study of the literature and the author's own investigations it is shown that if carried out correctly the treatment gives a recovery rate of 30 to 40 per cent.

VAN CREVELD, Amsterdam, Netherlands.

Psychology and Psychiatry

ORAL AND WRITTEN WISHES OF RURAL AND CITY SCHOOL CHILDREN. GEORGE S. SPEER, Child Development **10**:151-155 (Sept.) 1939.

Oral and written expression of wishes were obtained from 115 children in city schools and 76 children in rural schools. The children ranged in age from 7 to 15; their grades, from the third to the eighth. Both groups were fairly consistent in their expression of wishes by the two methods. Rural children were more consistent in their wishes than city children. Rural children were somewhat reluctant to express wishes about other people in the oral interview but expressed more wishes of this type in writing. Girls expressed more wishes for things, more personal wishes, more wishes about other people and more immediate wishes than boys. Boys expressed more "to become" wishes, more wishes for peace and more wishes for money, and for larger amounts of money, than girls. Older children expressed more personal and "to become" wishes than younger children, who expressed more immediate wishes and more wishes for things. It is concluded that age and sex are most important in determining the type of goal or desire and that social and cultural differences determine the specific object of desire. The consistency of the expressions obtained in response to two different approaches suggests that reliable and valid indications of the desires and goals of the subjects have been obtained.

PALMER, Washington, D. C.

THE USE OF THE STANFORD-BINET (1937 REVISION) IN A GROUP OF NURSERY SCHOOL CHILDREN. I. S. BLACK, Child Development **10**:157 (Sept.) 1939.

A study of the 1937 revision of the Stanford-Binet scale was made in the Harriet Johnson Nursery School, New York. The children (2 to 6 years old)

were divided into groups according to amount of nursery school experience, and each child was given a Stanford-Binet and a Merrill-Palmer test. The children who were tested within six weeks of entrance to the school were retested the following spring on both scales. The children who were given their first test after six months or more of nursery school experience were retested only on the Standford-Binet scale. The comparison between the incoming children and those with nursery school experience on their first test showed:

1. The incoming group of 31 children obtained a mean intelligence quotient score indicating an intelligence quotient of 121.7 on the Stanford-Binet scale and 115.5 on the Merrill-Palmer scale. The correlation between two tests was 0.36.

2. The group with a minimum of six months' nursery school experience had a mean score on the Stanford-Binet scale of 131.2 and on the Merrill-Palmer scale of 129.8. The correlation was 0.64.

3. Retests were given to 27 of the incoming group. The Stanford-Binet results showed a rise from 122.1 to 128.1. The correlation between the first test and the retest was 0.80. The Merrill-Palmer results showed a rise from 116.9 to 134.5. The correlation was 0.58.

4. Retests on the Stanford-Binet scale, given approximately a year later to 29 children whose first test was given after six months or more of nursery school, showed a correlation of 0.94 between the first test and the retest.

The intelligence quotients obtained in preschool tests on the new Stanford-Binet scale appear to be highly reliable. Even over a period of change, such as entry into nursery school, there is rather high correlation between the first test and the retest (0.80); and when this factor of changing status is eliminated by giving the first test after nursery school experience, the correlation rises to 0.94, which compares favorably with the correlation shown in tests of children of school age.

The conclusion is that in many instances in which there is doubt as to the advisability of using the Stanford-Binet scale (for instance, with a very anxious child to whom answering a question is an ordeal, or with a child apparently capable but retarded in language) the Merrill-Palmer test is valuable. When time is not limited, the author prefers to give every child the Merrill-Palmer along with the Stanford-Binet test, in order to have a fuller picture of the child. When time is limited, however, and the test score is important, the Stanford-Binet scale is indicated.

FROM THE AUTHOR'S SUMMARY.

PSYCHOSES IN CHILDREN. E. I. FALSTEIN, Illinois M. J. **76**:271 (Sept.) 1939.

In this rather detailed report on the psychotic children seen at the Institute for Juvenile Research during 1938, the various so-called schizophrenic ones are described and their differences enumerated. The importance of the different etiologic factors is postulated for present and future study. Falstein believes that there is obviously a need for special facilities for the hospitalization, investigation and treatment of these psychotic children.

BARBOUR, Peoria, Ill.

THE I. Q.: A REPLY. B. L. WELLMAN, J. Psychol. **8**:143 (Oct.) 1939.

This paper is a reply to an article by B. R. Simpson in which he attacked the validity of Wellman's previously published data and interpretations on the mutability of the intelligence quotient. Wellman is adamant in her claims that in general the intelligence of children can be improved.

WEINFELD, Highland Park, Ill.

PROPHYLAXIS OF JUVENILE DELINQUENCY. B. DITULLIO, Med. inf., Rome **10**:297 (Oct.) 1939.

Of 200 so-called juvenile delinquents between 6 and 14 years of age who were studied, 104 came from homes of marked poverty, 40 from homes of poor moral

background and only 16 from homes of satisfactory social and economic status. One hundred and thirty came from families of high birth rate but also high infantile mortality (30 to 40 per cent).

HIGGINS, Boston.

Diseases of the Genitourinary Tract

CRYPTORCHIDISM. W. W. JOHNSON, J. A. M. A. **113**:25 (July 1) 1939.

Johnson feels that the treatment for cryptorchidism should be revamped. Endocrine therapy should be used as an adjunct to the effect of puberty to produce the descent, which he observed to occur spontaneously at that period in 313 of 544 boys. Surgical intervention should be reserved for those in whom cryptorchidism is associated with other conditions or in whom descent has not occurred by the sixteenth year. In this large series of boys, most of them untreated, the phenomenon of spontaneous normal descent was observed in routine examinations over a period of years. Among 31,000 boys, cryptorchidism occurred in 1.72 per cent. This is about eight times the incidence in adults (army recruits). Also, the author observed the relative infrequency with which Fröhlich's syndrome, hernia and other abnormalities were associated with cryptorchidism.

HEERSMA, Kalamazoo, Mich.

HYPERGENITALISM IN CHILDREN. I. P. BRONSTEIN, J. Pediat. **14**:203 (Feb.) 1939.

Bronstein reports a case of hypergenitalism in a 9½ year old boy, who was mentally retarded but physically normal. Other signs of precocious development were absent such as spermatogenesis, premature ossification and epiphysial union. An encephalogram exhibited nothing pathologic, nor was there any evidence of hydrocephalus. The possibility of an intracranial involvement of the hypothalamus could not be ruled out. The Friedman test indicated an excess of gonadotropic substance in the urine, and an assay of the urine revealed a minimum of 400 mouse units. No determinable amounts of estrogen were present when the child was first seen, nor after treatment. Injections of estrone (theelin) (12,000 rat units; 60,000 international units) did not affect the excretion of the gonadotropic substance. Radiation of high voltage to the pituitary caused no change in the excretion of the gonadotropic substance.

RAUH, Cincinnati.

RENAL CALCIFICATION IN INFANCY AND CHILDHOOD. W. A. D. ANDERSON, J. Pediat. **14**:375 (March) 1939.

Thirty-one cases in which calcium deposits were found in the kidneys at autopsy are reported. The ages of the children ranged from 7 days to 11 years. In 11 cases only a very slight amount of calcium was present, either as a single deposit or as two or three small calcified masses, mainly intratubular, in the cortex or the medulla but occasionally in the interstitial tissue. A short outline of the 20 cases in which the calcification was more massive is included in the report. The calcium was most frequently limited to the cortical region and involved the tubules. In 4 patients who had received parathyroid extract and calcium salts, the calcium was also found in the small blood vessels. Evidence of renal damage was almost invariably observed both clinically and at autopsy. Acute infection, intestinal obstruction, dehydration and acidosis were each present in a number of cases. Administration of vitamin D was not an important factor in the renal calcification in any of these cases.

RAUH, Cincinnati.

TREATMENT OF INFANT VULVOVAGINITIS WITH ESTROGENIC HORMONE. J. C. WEED and C. G. COLLINS, South. M. J. **32**:1000 (Oct.) 1939.

Gonococcic vulvovaginitis in children is best treated with an estrogen. The mode of administration may be by mouth, by hypodermic injection or by supposi-

tory. The third method is advisable because (1) it offers the most efficient and most direct action, (2) its ease of administration is an important factor in the treatment of children, and (3) the treatment may be conducted by the patient's mother at home with minimal inconvenience to the patient and to the physician.

SCHLUTZ, Chicago.

WILMS' TUMORS: EMBRYONAL ADENOSARCOMAS OF THE KIDNEY. L. W. LONG, South. M. J. **32**:1016 (Oct.) 1939.

In every case of Wilms' tumor roentgen therapy should be used preoperatively to the point of shrinking the tumor mass. The growth should then be completely removed, without breakage and without destroying its natural barriers. The transperitoneal approach for its removal is preferable. The taking of a specimen for biopsy by any method is condemned, since it breaks open the capsule which is the natural barrier. The optimal time for removal of this tumor falls in the period after the shrinking of the tumor mass, before its regrowth starts. Recurrence of the tumor indicates failure of treatment, after which no form of therapy offers any hope, though roentgen therapy is palliative.

SCHLUTZ, Chicago.

ADENOMYOSARCOMA OF THE KIDNEY. E. GAULIN, Union méd. du Canada **68**:470 (May) 1939.

Four cases of adenomyosarcoma of the kidney are presented. The patients were babies of 12 months, 15 months, 30 months and 37 months. Two of these babies were treated by surgery alone. They died of recurrent tumors, seven and eight months later. The third received postoperative roentgen therapy, but died of metastases in spite of treatment. The fourth was given preoperative roentgen therapy, and ten months after operation the condition showed no evidence of recurrence.

Gaulin recommends the following method of handling such patients: (1) complete studies of the blood including determination of the blood urea and creatinine and Wassermann tests; (2) roentgen examination of the lungs and bones to rule out metastases; (3) treatment with roentgen rays of high voltage, the leukocyte count being followed carefully and blood transfusions being given if necessary, and (4) nephrectomy two weeks after the final roentgen treatment.

DAFFINEE, Boston.

FREQUENCY OF CRYPTORCHIDISM IN PRIMARY SCHOOL CHILDREN IN MESSINA. G. MILIO, Med. inf., Rome **10**:280 (Sept.) 1939.

Of 1,055 school boys in the primary grades examined 281 (26.5 per cent) had undescended testicles; in 120 (11.3 per cent) the condition was bilateral and in 161 (15.2 per cent) unilateral. For the first grades the percentage was 31 per cent; for the second, 30 per cent; for the third, 28 per cent; for the fourth, 23 per cent, and for the fifth, 19 per cent.

HIGGINS, Boston.

VITAMIN C IN THE TREATMENT OF CHILDREN WITH GLOMERULAR NEPHRITIS. L. ANGELINI, Med. inf., Rome **10**:281 (Sept.) 1939.

Daily intravenous injections of 0.1 Gm. of vitamin C for as many as twenty days caused definite and rapid diminution in hematuria and diuresis in 15 children with acute glomerulonephritis. There was improvement in the other nephritic symptoms—edema, hyperazotemia and hypertension.

HIGGINS, Boston.

PATHOLOGIC ANATOMIC FEATURES OF NEPHROTIC-GLYCOSURIC DWARFISM WITH HYPOPHOSPHATEMIC RICKETS IN EARLY CHILDHOOD (FANCONI). H. STURZENEGGER, Ann. pædiat. **153**:1 (April) 1939.

The following forms of renal nanosomia have been observed: (1) the nephritic nanosomia of older infants with hyperphosphatemic rickets, (2) the nephrotic-glycosuric nanosomia of young infants with hypophosphatemic rickets and (3) the juvenile renal osteodystrophy with nanosomia and hyperphosphatemia.

In a girl of 5 years and 4 months with renal nonosomia, type 2, who died of uremia, the following clinical manifestations were noted: congenital lability of the sugar metabolism, nephrosis, renal insufficiency with terminal rise in blood urea, acidosis, probably hypophosphatemia, nanosomia and renal rickets.

The nephrosis was probably due to the congenital lability of the sugar metabolism and to a Bacillus coli infection of the urinary tract. It was possibly caused by accumulation of an intermediary metabolic product hitherto unknown. The case does not enable one to decide whether a congenital or a hereditary deficiency of the organ favored the rise of nephrosis. The histologic examination, however, did not point to any disturbance in the development of the kidney.

The skeleton showed almost proportionate slender dwarfism, histologically a rarefying disturbance of bone regeneration and a severe disturbance of ossification in the sense of rickets.

Hamperl, Wallis and Loeschke explain renal dwarfism as a sequel to a governing constitutional noxiousness which they believe acts primarily on the kidneys and the skeleton. As against this conception the opinion is proffered that nanosomia and the disturbance of osteoblastosis are the sequels of a renal metabolic disturbance. The renal metabolic disturbance very probably leads in all the renal diseases of the skeleton to a diminution in the activity of the osteoblasts and thus to a typical disturbance of the regeneration of bone. In addition, it produces in the growing skeleton dwarfism and a rachitic disturbance of ossification. The disturbance of bone regeneration, the nanosomia and the rickets together present the picture of renal osteodystrophy of the growing skeleton.

FROM AUTHOR'S SUMMARY.

INCREASE OF ACETONURIA. F. DEMUTH, Ann. pædiat. **153**:349 (Sept.) 1939.

Demuth reports an increase of cases of acetonuria and attempts to determine the causes.

FROM AUTHOR'S SUMMARY.

Diseases of the Ductless Glands; Endocrinology

PHYSIOLOGY AND PRINCIPAL INTERRELATIONS OF THE THYROID GLAND. D. MARINE, Bull. New York Acad. Med. **15**:790 (Dec.) 1939.

This is a résumé of the latest developments in the anatomy, physiology and biochemistry of the thyroid gland. With this newer knowledge as a basis, the relationships of this gland to the pituitary, the gonads, the adrenal cortex, the thymus, the parathyroid and the chromaffin system are discussed. The interrelation of thyroid function and the production of creatine is of special interest, as is also the relation of the various vitamins to thyroid function. JAHR, Omaha.

COMPARATIVE STUDIES OF GONADOTROPIC HORMONES. C. F. FLUHMANN, Endocrinology **25**:193 (Aug.) 1939.

Long-continued daily injection of various gonadotropic substances into rats 21 to 23 days of age indicated fundamental differences which justified their classification into three groups: anterior pituitary, chorionic and equine gonadotropic hormones.

With the sheep anterior pituitary extract, the ovaries reached a maximal weight far in excess of the normal in about a hundred days and subsequently became markedly atrophic.

The chorionic gonadotropic substance (prepared from the blood of pregnant women) produced a progressive increase in ovarian weight, which lasted longer and was much greater than with the anterior pituitary extract. Eventually the weight regressed, but it still remained almost four times greater than that of normal controls, even after one year's treatment.

Injection of the equine gonadotropic substance (prepared from the serum of pregnant mares) at the dosage employed produced singularly negative results. Although it is the most potent gonadotropic preparation available, its daily injection for one hundred and twenty-three days yielded ovaries weighing scarcely more than those of control rats of the same age. However, in proportion to the size of the ovaries, the uteri enlarged more than with either of the other two preparations.

JACOBSEN, Buffalo.

OBSERVATIONS OF NITROGEN AND CALCIUM BALANCES AS AFFECTED BY GROWTH AND GONADOTROPIC HORMONES ADMINISTERED FOR SHORT PERIODS TO GROWING CHILDREN. J. A. JOHNSTON and J. W. MARONEY, Endocrinology **25**:199 (Aug.) 1939.

Johnston and Maroney present observations on the nitrogen balance and, in some instances, the calcium balance in children of the propubertal and postpubertal periods following the administration for short periods of a gonadotropic substance from the urine of pregnant women (antuitrin S) and an extract of the anterior lobe of the pituitary said to contain a growth-promoting factor (antuitrin G). A variety of responses were noted, anabolic, katabolic and negative, which might be explained as being conditioned by, (1) the presence or absence of a hormonal defect, (2) the state of the stores as judged by the control balance and (3) the age of the child. Instances of complete loss of response, in the nature of an antihormonal effect, were encountered.

JACOBSEN, Buffalo.

EFFECT OF PROLACTIN ON MAMMARY GLAND SECRETION. H. L. STEWART JR. and J. P. PRATT, Endocrinology **25**:347 (Sept.) 1939.

It has been established that the administration of prolactin induces lactation in animals. The authors undertook to determine whether an analogous action occurs in women.

In a preliminary study of 380 mothers, the 333 mothers who nursed their babies, were classified on the basis of the total secretion of milk on the fifth day post partum, as follows:

1. Full breast nursing, signifying an output greater than 250 cc. without complementary feedings being required, 207 mothers.

2. Part time nursing, signifying an output greater than 250 cc. with complementary feedings being required, 70 mothers.

3. Deficient nursing, signifying an output less than 250 cc., 56 mothers.

By weighing the baby before and after each nursing period and pumping the residual milk, a satisfactory measure of breast secretion is provided. Whether the curve of secretion is high or low, the rise is greater during the first five postpartum days than it is thereafter. The fifth postpartum day is the logical time to attempt to influence lactation. A true deficiency of lactation may be assumed if the daily secretion is 250 cc. or less by the fifth day.

Fourteen women whose secretion was deficient and who were receiving 1,000 pigeon units of prolactin daily from the sixth to the ninth postpartum day inclu-

sively showed an increase of 40 per cent in secretion. Ten women with a similar deficiency who served as controls and who received injections of a similar fluid without prolactin showed an increase of 42 per cent in secretion. No influence on lactation could be attributed to the administration of prolactin. The action of prolactin in animals and in women is not analogous. The suckling influence of the baby has no stimulating effect on deficient lactation. JACOBSEN, Buffalo.

A STUDY OF MUSCULAR EFFICIENCY IN RATS INJECTED WITH ANTERIOR PITUITARY GROWTH FACTOR. E. B. PLATTENER and C. I. REED, Endocrinology **25**:401 (Sept.) 1939.

Because it has been shown that an extract of the anterior lobe of the pituitary containing the growth factor when administered to white rats increases the total nitrogen content of muscle, calculated on a dry weight basis, and also the water content, it seemed of interest to determine whether these changes represent any physiologic advantage.

Myograms taken on the gastrocnemii of female white rats that had been treated with this extract showed no physiologic advantage over the muscles of untreated controls in spite of a greater average size of the treated rats.

JACOBSEN, Buffalo.

TREATMENT OF HYPOGENITALISM IN THE MALE WITH THE GONADOTROPIC PRINCIPLE OF PREGNANT MARES' SERUM. R. H. KUNSTADTER, Endocrinology **25**:661 (Nov.) 1939.

It is now generally agreed that in the treatment of hypogenitalism and cryptorchidism there is definite benefit from the use of gonadotropic substance from the urine of pregnant women and from placenta and from the use of anterior pituitary extracts. But there are limitations to the value of these preparations. The author therefore used an extract of pregnant mare's serum in the treatment of 14 sexually underdeveloped boys.

Definite improvement, as evidenced by the growth of the genitalia, the appearance of secondary sex characteristics or the descent, partial or complete, of undescended testes, occurred in 8, or 66.6 per cent. There was no change in the distribution of fat, nor was there any loss of weight in these patients.

It is believed that mare's serum is of definite therapeutic value in certain cases of hypogenitalism and cryptorchidism.

As yet the optimal effective dose has not been established, but the author believes that 50 to 100 units given intramuscularly three times a week probably will be more effective than the 10 to 20 units administered intramuscularly three times a week to his patients. With the higher dose results would probably be obtained in a shorter period of time. JACOBSEN, Buffalo.

EPIPHYSIAL NECROSIS IN PITUITARY GIGANTISM. E. H. TRAUB, Arch. Dis. Childhood **14**:203 (Sept.) 1939.

A case is reported in which the whole skeletal system appeared to be affected by multiple epiphysial necroses. Roentgen examination showed typical osteochondritis deformans of the right hip joint, Köhler's disease of both tarsal scaphoids, changes in the bodies of the vertebrae and epiphysial necrosis in the heads of the first metatarsals, a condition which does not appear to have been reported previously. In many cases of epiphysial necrosis nothing is known regarding the cause of the osseous changes. In the case reported here the skeletal changes appeared to have been caused by endocrine dysfunction. KELLY, Milwaukee.

DIABETES INSIPIDUS TREATED BY SLOWLY ACTING PITUITARY EMULSION. D. COURT and S. TAYLOR, Proc. Roy. Soc. Med. **32**:1203 (Aug.) 1939.

The case reported was that of a boy of 4 years.

WILLIAMSON, New Orleans.

THYMIC HYPERTROPHY IN THE INFANT. A. PLICHET, Presse méd. **47**:767 (May 20) 1939.

Plichet summarizes the articles on the thymus which were presented at the San Francisco session of the American Medical Association, June 16, 1938.

DAFFINEE, Boston.

FAMILIAL COLLOID GOITER. R. BUCETA DE BUÑO, Arch. de pediat. d. Uruguay **9**:745 (Dec.) 1938.

Familial colloid goiter was present in a mother and her 3 children. The older child, a girl of 15 years, also showed gonadal insufficiency. The use of an estrogen established regular menstruation. The second child, a girl of 14 years, showed marked improvement under thyroid treatment.

The third child, aged 11 years, was noticeably retarded in growth and in addition to the enlarged thyroid showed marked pituitary insufficiency.

SCHLUTZ, Chicago.

Diseases of Muscles, Bones, Joints and Lymph Glands

THE APPEARANCE OF CENTERS OF OSSIFICATION FROM BIRTH TO FIVE YEARS. C. C. FRANCIS and P. P. WERLE (with the assistance of ALTON BEHM), Am. J. Phys. Anthrop. **24**:273, 1939.

"1. A schedule for the date and sequence in appearance of centers of ossification for both sexes from birth to 5 years is presented.

"2. This schedule differs fundamentally from others in the literature because it is not based upon the average or fiftieth percentile of the population but upon the eightieth percentile. The 1,728 sets of records upon which this schedule was tested were the result of as many examinations of 307 boys and 315 girls of superior physical and economic status serially examined at 3, 6, 9 and 12 months of age and thereafter at 6-month intervals to the fifth birthday.

"3. The stated age for the appearance of each center is that date when it may be expected to appear in a healthy child with a satisfactory environment.

"4. The reason for variation in date of commencement of ossification and in its progressive development is not some obscure cause inherent in the germ plasm but the result of metabolic disturbance, a subject which is so important that it must be dealt with in a separate communication.

"5. The centers of ossification appear in sheaves of miscellaneous composition but primary centers are more apt to be delayed in commencement of ossification than are centers appearing in epiphyses.

"6. Irregularities of ossification, commonly called osteochondrosis, may often be found, once a center has commenced to ossify even though there is no clinical evidence of disturbance. Again primary centers are more prone to display this irregularity and the patella of boys is the most frequent site for its occurrence."

AUTHORS' SUMMARY.

MULTIPLE TUBERCULOUS OSTEITIS. R. H. DOBBS, Proc. Roy. Soc. Med. **32**:1376 (Sept.) 1939.

The patient was first examined at the age of 9 months because of a swelling on the head noticed three weeks previously. Admitted to the hospital at the age

of 11 months, the child looked ill, miserably undernourished and toxic. There were three large swellings on the head, one over the frontal, a second over the left parietal and a third over the right parietal bone. The swellings were fluctuant and tense but not red or tender. On the left arm there was a fluctuant swelling at the lower edge of the humerus, one at the middle of the radius and a third at the lower end of the ulna. On the right forearm there was a swelling, and the right thumb was greatly swollen over the metacarpal. The Mantoux reaction with a 1:1,000 dilution of old tuberculin was positive. The roentgenologist reported that the three skull bones showed large areas of rarefaction and fragmentation, that the long bones showed numerous cystic areas of rarefaction and that there was complete destruction of the metacarpal of the right thumb. He also reported considerable enlargement of the shadow at the right hilus. Scrapings from the lesion of the thumb showed thick, yellowish white cheesy material, which on microscopic examination was that of an inflammatory process in which there was rather an unusual number of plasma cells as well as small round cells. In places necrosis was quite marked and giant cells were plentiful. The appearance was that of tuberculous granulation tissue showing considerable activity. The report is accompanied with roentgenograms of bones and of the chest and a commentary in which this condition is discussed.

WILLIAMSON, New Orleans.

TUBERCULOSIS OF THE KNEE. A. G. H. CLAY, Proc. Roy. Soc. Med. **32**:1379 (Sept.) 1939.

Tuberculosis of the knee is reported in a child of 3 years.

WILLIAMSON, New Orleans.

LATE TYPHOID SUPPURATIVE OSTEITIS OF THE FEMUR. E. SORREL, E. FEDER and G. BACHELIN, Bull. Soc. pédiat. de Paris **37**:56 (Feb.) 1939.

A girl 11½ years old had severe typhoid fever. During convalescence she complained of pain in the left thigh, which was thought to be due to the numerous injections which had been made in that region. Over a year later an abscess of the left thigh which communicated with the femur was incised and drained. A pure culture of Bacillus typhosus was obtained from the pus aspirated from the abscess. The serum agglutination test for typhoid was negative. Roentgenograms of the bone showed slight irregularity of the periosteum and slight rarefaction of the center of the diaphysis at the junction of the upper and middle thirds. Vaccine therapy was also administered. Recovery was uneventful. Another roentgenogram of the femur taken four months after the operation showed no abnormality, and the child continued perfectly well.

BENJAMIN, Montreal, Canada.

A CONGENITAL SARCOMA OF THE SOFT PART OF THE RIGHT LEG. H. BRANDT, Med. Klin. **35**:419 (March 31) 1939.

Brandt reports a case of a congenital sarcoma of the soft part of the right leg. He discusses the causes of the condition and reviews the literature. The article is accompanied with a photograph of the patient, roentgenograms and photomicrographs.

SIEMSEN, Chicago.

HEMATOLOGIC DIAGNOSIS OF HODGKIN'S DISEASE. F. V. MONTES, München. med. Wchnschr. **86**:255 (Feb. 17) 1939.

In a long illustrated article Montes discusses the difficulties in the hematologic diagnosis of Hodgkin's disease. Sternal puncture, he believes, involves considerable difficulty, and then in only about half the cases is the bone marrow involved. Adenopuncture seems to be the procedure of choice. Only an experienced hema-

tologist can pick out the characteristic cells necessary for the diagnosis. It is easier to get the patient to submit to glandular puncture than to biopsy. Repeated adenopunctures can be made to evaluate treatment, and there is no danger of reactivation of the disease. Sometimes access to diseased glands is difficult. Cases have been described in which only splenic puncture made the diagnosis possible.

BRAHDY, Mount Vernon, N. Y.

A SINGULAR TYPE OF GRANULOMATOSIS IN AN INFANT. G. MUHL, Acta pædiat. **23**:376, 1939; **24**:265, 1939.

A description is supplied of a syndrome consisting of general enlargement of lymph glands, moderate secondary anemia, slight neutrophilic leukocytosis and multiple areas of rarefaction with periosteal deposits in the ribs and in the bones of the extremities. The illness commenced in infancy and pursued an afebrile course. Evidence for syphilis, tuberculosis and brucellosis was lacking. Biopsy revealed a peculiar metaplasia of the lymph nodes in which large giant cells were prominent. A remission of symptoms commenced a few months after the onset, and at the end of a year the child was thought to be entirely well. The observations at biopsy and the apparent cure were thought to exclude malignant neoplasm, Hodgkin's disease and Boeck's sarcoid.

McCUNE, New York.

ALBERS-SCHÖNBERG DISEASE. S. VAN CREVELD, Maandschr. v. kindergeneesk. **8**:335 (June) 1939.

"Marble bones" disease in a girl now 7 years old is described, with the clinical, clinical-chemical and roentgenologic researches. A discussion is given of the different symptoms in relation to some hypotheses concerning the origin of the disease and in relation to the symptoms observed in analogous cases.

VAN CREVELD, Amsterdam, Netherlands.

Skin Diseases; Allergy

RADIUM TREATMENT OF ANGIOMA IN CHILDREN. R. PATERSON and M. C. TOD, Am. J. Roentgenol. **42**:726 (Nov.) 1939.

From the point of view of treatment angiomas are divisible into three types: (1) capillary, (2) compact and (3) cavernous. Irradiation either with gamma rays or filtered roentgen rays is the treatment of choice for all but the capillary type. There is no known satisfactory method of treating the latter type. The authors stress the fact that irradiation is a safe, single, certain method of destroying angiomas.

The best age at which to treat an angioma is that from 3 months to 2 years; however, treatment is not contraindicated at any age. The authors' method of giving gamma radiation is by the use of radon sealed into silver seeds which are destroyed when the prescribed dose has been given. These seeds are arranged on a mold built of elastoplast; the seeds are placed in an ideal circle (which obtains homogeneous irradiation) by making the ratio of the diameter of the treating circle to the skin distance just under 3:1. The dose is calculated from graphs which give for the area treated the milligram hours required. The dosage rate is adjusted so that the treatment takes five or six days. If radon is unavailable, radium needles are stitched into the elastoplast. The dose for treatment with elastoplast molds has been fixed at 1,500 roentgens over four days or 1,000 roentgens over two days, repeated at two month intervals. Two or three such applications are usually enough.

SQUIRE, Chicago.

AN ANALYSIS OF THE COMPARATIVE RESULTS OF SKIN TESTING WITH COOKED AND UNCOOKED FOODS: PRELIMINARY REPORT. J. I. MALKIN and H. MARKOW, J. Allergy **10**:337 (May) 1939.

A group of foods that are eaten in the raw or the cooked state were used to determine whether there is any difference in the reactions to intradermal testing. Seven hundred and eleven pairs of tests were done on over 100 allergic persons. The results were equal in 91.8 per cent of the reactions; in 3.9 per cent the extract from the raw food elicited a positive reaction against a negative test with cooked food, and in 4.3 per cent the extract from the cooked food reacted positively against a negative test with raw food. The authors feel that it may be concluded that in cutaneous tests the use of extracts from cooked food is not essential or practical. "Changes occurring in foods as a result of cooking are so infrequently demonstrable by test that they may be ignored, except in the occasional case, in which the diagnosis is reached by the clinical application of the trial and error diet with raw and cooked foods." HOYER, Cincinnati.

COMBINED ORAL AND SUBCUTANEOUS TREATMENT FOR RAGWEED POLLINOSIS. McK. LONDON, J. Allergy **10**:453 (July) 1939.

Combined oral and subcutaneous therapy was tried in 1938 on 25 patients who had been treated with subcutaneous therapy alone in 1937 and on 19 patients who had not been treated in 1937. Oral therapy was used from the last week in July until the middle of August. An extract of mixed ragweed in a concentration of 5 per cent was given in doses of 2 minims (0.12 cc.) three times a day, which was gradually increased to 10 minims (0.61 cc.) three times a day. Most patients received a total of 1 ounce (28.5 Gm.) of the extract.

Other experiments were performed in an attempt to determine whether the extract was absorbed from the intestinal tract. The authors conclude that:

1. Comparatively large doses of extract from ragweed pollen may be taken orally, together with regular subcutaneous injections of ragweed extract.

2. Absorption of the active principle of ragweed into the blood stream, as a result of oral ingestion of the extract from ragweed pollen is negligible, if it occurs at all.

3. Patients adequately treated by the subcutaneous method can expect no further benefit from oral ingestion of pollen. HOYER, Cincinnati.

ALLERGIC MANIFESTATIONS IN THE CENTRAL NERVOUS SYSTEM. T. W. CLARKE, New York State J. Med. **39**:1498 (Aug. 1) 1939.

Two children with epilepsy were found by skin tests to be allergic to several substances. These foods were removed from the diet. One child is now entirely free from convulsions, and in the other their number has been greatly reduced.

AIKMAN, Rochester, N. Y.

PHYSIOTHERAPY IN DISEASES OF THE SKIN: PARTS I AND II. R. AITKEN, Brit. J. Phys. Med. **2**:192 (July); 214 (Aug.) 1939.

I. The value of roentgen and ultraviolet radiation in the treatment of various disorders of the skin is discussed. Ultraviolet radiation is beneficial in most types of cutaneous tuberculosis. Roentgen radiation should never be used in scrofuloderma, for the risk of carcinoma is great, while the cosmetic result is poor compared with that obtained with ultraviolet ray treatment.

Furunculosis benefits greatly from ultraviolet irradiation. The treatment is of most use in the chronic form, in which the boils appear singly or in numbers over a long period. For single boils, roentgen radiation is preferable.

II. The value of roentgen and ultraviolet radiation in the treatment of other cutaneous disorders is considered. Ultraviolet radiation may decrease the dura-

tion of pityriasis rosea from six weeks to four weeks, but it is doubtful if the amount of time saved is worth the additional discomfort. Physicians should exercise extreme caution in giving ultraviolet radiation to patients who are being treated with sulfanilamide and kindred drugs, for certain workers believe that a toxic eruption is more likely to occur in such patients. Roentgen treatment is preferred for epilation in ringworm of the scalp because some children experience symptoms of disease of joints after the administration of thallium. Ultraviolet radiation is of little value in this condition except for diagnosis. Roentgen therapy is of definite value in acne vulgaris and should be started early. It is also frequently beneficial in the treatment of warts, especially those of the plantar type.

HARTMAN, Cleveland.

SOME CASES OF IDIOSYNCRASY FOR COW'S MILK. G. VON SYDOW, Acta pædiat. **23**:383, 1939.

Von Sydow describes 4 cases of congenital idiosyncrasy for cow's milk and compares them with 12 cases recorded in the literature; summaries of these are provided. This comparison indicates that two types of idiosyncrasy for cow's milk can be distinguished: One type has an evident constitutional basis, as indicated by a family history of allergic disease; in this type the reaction to cow's milk is apt to take place predominantly in the skin, as eczema, or in the respiratory tract, as asthma. This type is not readily amenable to desensitization. The second type is not obviously constitutional in origin; its manifestations are more strikingly gastrointestinal in character; tolerance for cow's milk is readily procured by desensitization and in some cases apparently develops spontaneously.

MCCUNE, New York.

A CASE OF "CONGENITAL SKIN DEFECTS." P. VAN DER LINDE, Nederl. tijdschr. v. geneesk. **83**:3721 (July 22) 1939.

Linde describes a case of "congenital skin defects." On symmetric places just below the costal margins were patches of what looked like epidermolysis bullosa hereditaria. The latter condition is assumed to be the most frequent cause of such lesions next to tearing off of amniotic strands. However, various factors must be present that require further investigation.

VAN CREVELD, Amsterdam, Netherlands.

TREATMENT OF KELOID, DUPUYTREN'S CONTRACTURE AND SCLERODERMA BY MEANS OF IONTOPHORESIS. M. NYKERK, Nederl. tijdschr. v. geneesk. **83**:5135 (Oct. 28) 1939.

Thirteen patients (5 of them below the age of 13 years) have been treated with potassium-iodine ionization, 4 with keloid, 2 with Dupuytren's contracture and 7 with scleroderma. Four of these patients, viz., 1 with keloid, 1 with Dupuytren's contracture and 2 with scleroderma, have been cured clinically; the conditions of the others have improved. As a treatment with ionization must be continued for a long time, it must be applied only after more simple treatments have failed. The electric current may not be raised too high lest hyperemia, edema, necrosis and ulceration (galvanic ulceration) occur. The current chosen was such as could just be supported by the patient.

VAN CREVELD, Amsterdam, Netherlands.

PROPHYLAXIS OF ECZEMA INFANTUM. J. J. NEUTEBOOM, Nederl. tijdschr. v. geneesk. **83**:5723 (Dec. 9) 1939.

It is urged that the prophylaxis of eczema in infants should start before birth by aiming at an appropriate nutrition of the pregnant woman and effective treatment of all complaints during pregnancy. The baby should be bathed once a day, cleansing only the hairy part of the head and the creases of the skin with water

and soap. As soon as the first symptoms of eczema appear, the diseased part of the skin should have no contact with water and soap, the eruption being treated with equal parts of 0.5 per cent resorcinol glycerol and boric acid.

VAN CREVELD, Amsterdam, Netherlands.

Miscellaneous

TIDES IN FEVER. PLONSKER, Ann. pædiat. **153**:30 (April) 1939.

The laws concerning the course of acute feverish illnesses as explained by Finkelstein have been tested in 700 histories. In 619 of these the course ran in waves, the length of which was seven days or a multiple of seven or of three and a half days; 32 showed waves of different lengths. The borders of the single waves were formed by the then existing deepest temperature points. The single temperature is never to be valued according to its absolute height but always relatively, i. e., according to its position in the wave course. At the end of illnesses waves were found in normal temperature.

These laws were found valid also for burns. The importance of the laws for the therapy of otitis and empyema has been discussed.

So-called relapses are often new fever waves in the course of the same illness. Typical curves are deduced in rheumatic fever and chorea minor. It is pointed out that dysentery also runs its course in waves. FROM AUTHOR'S SUMMARY.

THE DESCENDANTS OF PERSONS WITH ALCOHOLISM. L. E. GABRIEL, Arch. f. Psychiat. **102**:506 (Nov.) 1934.

Gabriel reports an investigation of the children of a large number of persons suffering from alcoholism, with special reference to the occurrence of psychopathic and psychotic traits. The material consists of 728 patients with alcoholism; 223 were committed to a hospital for persons with mental disease and 505 to an institution for inebriates; 1,094 children were studied. The family histories of the patients themselves showed a marked hereditary taint in the ascendants. The most important feature in this regard was the fact that alcoholism was particularly frequent in the ascendants of patients who showed alcoholic psychoses or criminal tendencies. In the 728 cases there were 1,347 pregnancies, of which 1,094 terminated in the birth of living children. Of these children, 17 per cent born of alcoholic parents in hospitals and 13 per cent of the others died, the highest death rate being in children between 1 and 10 years of age. There was a large percentage of mental aberrations in these children, including alcoholism, criminality, mental diseases of various types, suicidal attempts, etc. The author comes to the conclusion that a comparison between the abnormal persons among the ascendants, the patients themselves and the children points to an increase in abnormal features already present rather than to an occurrence of new psychic difficulties.

MALAMUD, Iowa City. [ARCH. NEUROL. & PSYCHIAT.]

Society Transactions

AMERICAN PEDIATRIC SOCIETY

HERBERT B. WILCOX, M.D., *President*

HUGH MCCULLOCH, M.D., *Secretary*

Annual Meeting, Skytop, Pa., May 2-4, 1940

First Session

Thursday Afternoon, May 2

President's Address: The Pediatrician in the Councils of the Nation. HERBERT B. WILCOX, M.D., New York.

This article was published in full in the AMERICAN JOURNAL OF DISEASES OF CHILDREN (**60**:1 [July] 1940).

Between Meal Feedings. DR. CHARLES HENDEE SMITH, New York.

Some pediatricians hold that children should eat nothing between their three regular meals. Others allow food in the midmorning, midafternoon or both. Of several factors involved, foremost is the time of each meal and the intervals between meals. Public school children, whose hours are 9 to 12 and 1 to 3, have a short morning and a long afternoon. Preschool children have approximately the same meal hours. Private school children, with a single session from 9 to 1 o'clock, have a long morning and a short afternoon.

Public school children should finish breakfast by 8 o'clock, in order to have time for the toilet and to leave for school by 8:30, without hurry. An adequate breakfast of fruit, cereal, bread and butter, with 10 to 12 ounces (295 to 355 cc.) of milk (plus an egg for older children), is not digested until 11 or later. No food is needed in the four hours between breakfast and lunch. But the afternoon interval is over five hours; the child is hungry long before the evening meal and demands food soon after school. The private school child in the longer morning interval is often faint with hunger before his lunch at 1:15 or later. He is entitled to food at about 11 o'clock, but needs nothing between lunch and dinner.

The kind of food taken deserves consideration. Milk requires three to three and one-half hours for complete gastric digestion. This fact has been known for many years and has been demonstrated by many observers. In exceptional cases of hypermotility the stomach may empty in two to three hours. But for the average child milk seems to be an undesirable food even for the long interval. To give it at 10:30 to 11 and then send the child home for lunch at 12 violates the rules of physiology, dietetics and common sense. Experience shows that the appetite for lunch may be much impaired. Roentgenograms demonstrate that milk taken at 10:30 a. m. may still be in the stomach at 6 p. m.

Bread with butter, marmalade or jelly, crackers, simple cookies and plain cake are less difficult to digest than milk for most children. They impair the appetite for the next meal little if given at least two hours before it. Taken after school, they are well digested by 6 p. m. They can be carried to school for midmorning in the single session, saving the trouble of serving milk and the bookkeeping involved in charging the parents.

Fruit juice or tomato juice alone supplies too little to satisfy most children. Crackers or an equivalent should be given with them. This combination is

digested rapidly. It is also the best afternoon feeding for the runabout child. The physicians who order milk at 3 o'clock are often the most ardent advocates of four or even five hour intervals for small infants!

Clinical experience has shown several advantages in substituting fruit juice and crackers or bread for milk between meals. There is less anorexia, underweight children gain better, and some children subject to recurrent colds have fewer attacks.

Children coming to school without breakfast because of poverty should be fed at 9 o'clock. To make them wait until recess is cruel. It is an added injustice to send them home to what lunch they may get, with a stomach partly full of undigested milk! In many public schools milk is given at the morning recess by relief agencies, often against medical advice. In private schools 35 to 75 per cent of the children take milk in midmorning. This matter is one on which organized pediatricians should come to an agreement, so that parents and lay agencies may have some authoritative opinion on which to base a plan of between meal feeding.

DISCUSSION

DR. CHARLES G. KERLEY, New York: I wish I could tell you in how many cases I have relieved anorexia, recurrent vomiting and other minor digestive disorders, and incidentally made a great deal of reputation which I hardly deserve, by establishing the child on three meal a day feeding.

One of the troubles that is fundamental in the use of milk in feeding children is the "quart a day" idea. If there is a fallacy in pediatric practice, it is the general insistence on the necessity of a "quart of milk a day."

When one has been in practice for a considerable number of years, there are certain prescriptions which are repeated oftener than others. One that I have probably written for hundreds of children is the simple one of sodium bicarbonate 4 grains (0.25 Gm.), bismuth subcarbonate 4 grains and magnesium carbonate 2 grains (0.128 Gm.), to be given before meals on an empty stomach, and, incidentally, with that prescription three meals a day are invariably established; milk and other foods between meals are forbidden.

On account of the habit of between meal feeding, formed largely because of competition in the private schools, my patients have to have something at 10:30 or 11 o'clock, with the other children, or he or she feels highly abused. It has been my custom for years to allow an apple or an orange at that time. At their next visit, after two or three weeks, the mothers are highly delighted and say that "those are the most wonderful powders that were even given for a poor appetite."

DR. CHARLES ANDERSON ALDRICH, Winnetka, Ill.: I rise not to say much myself, but to suggest what I think Dr. Smith must have had in his original paper and what I wish he would take up more in detail in his discussion. That is the question of individual differences.

It seems to me that pediatricians can all agree on some things he has said about milk, but there are great individual differences in the ability of children to take it and get along well on it.

DR. GEORGE M. LYON, Huntington, W. Va.: Unless one has had occasion, as I recently have, to find out just what the "big doctors," as Dr. Trask puts it, think about this matter, I am sure one would not be familiar with the paucity of helpful statements and the lack of uniformity of opinion in authoritative pediatric literature. It is really disappointing.

In daily work with school children one finds that the situation has been made most confusing by the nutritionists and others presenting their characteristically firm statements. Almost with regularity, the rank and file of special workers think only of that particular phase of the child's life with which their main activity is concerned, having generally little regard for the other aspects of the child's life and problems; and they, as a rule, rather than the physician of the

child, are the ones who make the blanket recommendations as to giving midmorning or midafternoon milk feedings.

The routine feeding of milk midway between meals is certainly not advisable, yet it is amazing to see to what extent it has been introduced into some school health programs. In England there has been a widespread application of this practice, although there it has been aimed primarily at aiding the underprivileged child. Even in this country there seems to be a growing impression that children need midmorning milk. This point of view, to a great extent, arises from the apparently beneficial effect of the midmorning feeding of milk in those day nurseries and kindergartens attended by underprivileged children, who do not have adequate food at home.

At the time Dr. Smith's paper was announced, I was in the midst of a controversy with a local kindergarten training school, so I had occasion to look up some information in connection with this problem and to find what progress had been made with the application of this practice in England. It was interesting to note that even there it was accepted only as a controversial practice, with the health officers and nutritionists, on one hand, advocating between meal feedings of milk, and the pediatric observers of children, on the other, recommending the acceptance of this measure only after proper individualization of the problem. My own impression is that the children whom one sees more or less regularly in the office as private patients and who attend private nursery schools or kindergartens and are not exactly members of an underprivileged class, hardly seem to need this between meal milk feeding if matters in their lives are otherwise properly arranged. So many times one sees the unfortunate effects of this rather common practice in one's little private patients who have been going along nicely as to their growth and development and as to their attitudes toward meals. When they attend kindergarten and are obliged to take this between meal feeding, problems arise. There is no denying the fact that one of the most important of the things which help to upset them and ruin their appetite for their noon meal is the milk feeding at the morning recess. I have observed this repeatedly, and it presents an unfortunate problem in school-home-physician cooperation.

It seems to me that a good service would be accomplished if some authoritative pediatric pronouncements on this matter could be assembled. It might be of definite help in settling controversies of the type in which I find myself at home at present. There the head of the kindergarten department in a large training school for teachers insists that her modern training demands this practice.

There should be no doubt about what Dr. Aldrich said, for pediatricians recognize the tremendous importance of individual differences and realize that whether the program is fitted to the individual child or to a group of children, the matter of individual differences must be taken into consideration.

Not very long ago I was discussing this matter before a medical society in Fayette County, a very rural mining county in West Virginia. I made the statement that it was not common in my practice for children to have a good appetite at their noon meal if they had a feeding of milk in the middle of the morning. I said that while it not infrequently interfered with their gain in weight, I was not as much concerned about that as I was with the fact that it interfered in most instances with their having a proper attitude toward food. Dr. Fordham, a superior type of industrial physician, was there and presented some rather intelligent observations tending to contradict what I had said. With some well kept records, he showed that the children in several of the schools in his mining district had shown remarkable gains in weight and in school performance and ability after the introduction of a morning milk feeding. I then said to Dr. Fordham that there must be something else going on in his community with which I was not familiar. His explanation was interesting. These children took their milk at the opening of school each morning and not in the middle of the morning school session. The fathers of these children were going to the mines by 5 o'clock in the morning. The children themselves arose at the same time their fathers did, which was generally shortly after 4 o'clock in the morning. They had their breakfasts, as

a rule, around 4:30 o'clock, and they went to school at 8 o'clock. They had their mid-day meal somewhere between noon and 12:30 o'clock. No one can deny that these children should receive milk on entrance to school in the morning. It is likewise logical that they should show a better gain in weight curve and an improvement in school performance as compared with what was found during those times that they were not given this extra nourishment. This was a special situation, an "individual difference" in a community, if you please.

Certainly this is not what one encounters in the average family in private practice, where the child goes to school at 9 o'clock and then has an opportunity to eat something again shortly after 12. It is among these children that characteristically one sees the appetite for the noon meal spoiled by a midmorning feeding of milk. I am glad that Dr. Smith brought up this matter, and I wish that there could be much helpful comment on it.

A great deal of avoidable unpleasantness arises between the private pediatrician and the kindergarten or school authorities as a result of the lack of recorded authoritative pediatric opinion.

For the school administrator, such statements, if truly authoritative, will be of great aid when unpleasant situations arise in respect to this matter, for they are continually arising between individual parents and the school or between private physicians and the school when midmorning milk lunches are given and subsequent bad attitudes toward food develop among pediatric patients.

DR. SMITH: Dr. Kerley saved me two things: One was an invective against the "quart of milk a day" idea. The child who has a highball of milk morning and night and a milk pudding at noon gets approximately a quart of milk. But he doesnt have to *drink* a quart of milk. In many cases the child who does drink a quart of milk and gets added milk in puddings will not eat enough other food.

I had one sentence which I may have omitted, but which Dr. Kerley gave for me. It was this: "The very men who order milk at 3 o'clock are the ones who shudder with horror at anything less than a four hour interval for feeding infants."

I spoke of the individual variations, Dr. Aldrich. I am sure these exist, but I think that there are few children whose stomachs are empty in less than three hours after a milk meal. My associates and I have done a good many series, and the case I cited is one of the few in which the milk was out of the stomach in two hours.

Dr. Lyon's addition to my plea that pediatricians achieve some unanimity is helpful, and I thank him for his apt illustrations.

What is going on among the children under the pediatrician's care? I wonder how many physicians know what is happening to their patients in their own hospital wards, or even their own families, in this respect? My associates and I have written down in plain black and white in our wards a diet list and a statement as to what the children should be fed between meals, if anything. I recently went around to six or seven wards for older children and found four different plans of treatment in my very own "household." That was to make me humble. A new dietitian had sent up a lot of extra milk, and new head nurses gave it in the middle of the morning, in the afternoon or about an hour after supper, as they saw fit!

What is going on in the pediatrician's own house? One of my friends said he didn't know whether or not his children got milk in the middle of the afternoon; he was going to find out. I think Dr. Lyon's surmise that something was going on that was not obvious on the face of things is instructive.

Some interesting and amusing things came out of an experiment in a private school. This school had been under the influence of a man who believed in "nothing between meals." The children came home tired, too tired to eat and too cross to live with. When we started giving at 11 o'clock only crackers or bread and butter sandwiches, which the children brought to school, these children

worked better and more efficiently in the late morning and had more normal appetites at noon. But the first day one boy brought eight slices of bread made into four roast beef sandwiches! Moreover, it took some time for them to learn that one mustn't put a jelly sandwich into the hip pocket!

Survey of Obstetric Care Received by Rural Women, Based on a Study of Fifteen Hundred Births in Maryland. Dr. J. H. Mason Knox, Dr. Charles H. Peckham (by invitation) and Dr. M. E. Wegman (by invitation), Baltimore.

In four rural counties of Maryland obstetric care before birth and at the time of delivery was investigated in 1,523 cases. Of the subjects, 1,011 were white women and 512 were Negroes. Attempts were made to study all births in order to obtain a random sample. Immediately after a birth was reported, the local public health nurse visited the home and secured answers to a questionnaire.

Approximately 10 per cent of the white and 20 per cent of the Negro women had no prepartum care at all. Of the remainder, when minimum criteria were set up, less than half of the white and about one quarter of the Negro women could be considered as having had adequate care. The white women tended to seek care much earlier than the Negro women, with the majority of the former presenting themselves by the end of the fourth month of pregnancy and the majority of the latter coming between the sixth and the ninth month. Eighty-two per cent of the white women received prepartum care from private physicians, while 56 per cent of the Negro patients received care from the clinics of the state health department. White patients made a greater number of visits, on the average, for prepartum care. A physical examination, a determination of the blood pressure and a urinalysis were done for about 90 per cent of the patients, but the pelvis was measured in only 65 per cent of the white and 74 per cent of the Negro women. The better showing of the latter is thought to be due to the fact that measurement is a required procedure at all clinics. Serologic tests for syphilis were made for 40 per cent of the white and 60 per cent of the Negro patients, with the former having about 2.5 per cent and the latter about 25 per cent positive results. Three quarters of the patients whose tests were positive received treatment.

The delivery was done in the hospital for 40 per cent of the white and 14 per cent of the Negro women. Of the latter about one quarter were of the "emergency" type. Delivery was done by doctors for 90 per cent of the white and 40 per cent of the Negro women. Eight per cent of the deliveries of white women and 3 per cent of those of the Negroes were operative, about 40 per cent being cesarean sections. About 5 per cent of the white babies and 10 per cent of the Negro babies were reported as in unsatisfactory condition at the time of birth. The percentage unsatisfactory was highest for the group whose mothers had no prepartum care and lowest for those with adequate care.

These data show the serious shortcomings, particularly marked in the Negro race, in the care obtained by mothers in rural areas. It is believed that the excessive neonatal mortality in rural areas as compared with cities is connected in large part with these deficiencies in obstetric care.

Obstetric Anesthesia, Fetal Anoxemia and Fetal Apnea. Dr. Clement A. Smith (by invitation), Boston.

In order to discover any relationship between (*a*) the oxygen content of the newborn infant's blood at birth, (*b*) the promptness or delay of respiratory onset (apnea) and (*c*) the obstetric anesthetic used, determinations of oxygen were made on blood from the umbilical cords of 130 infants at or before the first breath. In certain instances the maternal oxygen levels were simultaneously obtained.

The data for each anesthetic studied showed a rather wide spread, probably because of the many variables in time, type of delivery, pressure and torsion of

the cord and variations in anesthetic technic to suit the individual patient. According to the anesthetic used, the results differed as follows:

1. Twenty-five infants delivered under drop ether showed 12.4 and 3.4 volumes per cent oxygen in the arterial and the venous blood, respectively. Seventeen infants breathed promptly. Eight were somewhat slow.

2. In 27 deliveries under nitrogen monoxide, even though 20 per cent oxygen was supposedly supplied in the anesthetic mixture, the infants were born with only 7.4 and 2.5 volumes per cent oxygen in the arterial and the venous blood. Twenty-one breathed at once. Six were slow.

3. Of 28 deliveries under nitrogen monoxide–oxygen–ether, 20 infants breathed at once; 8, slowly. The average arterial and venous oxygen levels were practically the same as those in infants delivered under nitrogen monoxide–oxygen.

4. Nineteen deliveries under cyclopropane were studied. In spite of high maternal oxygen levels, the infants showed an arterial level of 9.2 and a venous level of 3.7 volume per cent oxygen. These figures are below those for deliveries under ether but above those for deliveries under nitrogen monoxide mixtures. Twelve of these infants breathed promptly. Seven were somewhat apneic.

5. In a series of 26 deliveries under vinethene, ether vapor and oxygen, the infants have shown blood oxygen levels very similar to those born under ordinary drop ether.

There is some reason to believe that with nitrogen monoxide mixtures apnea of the newborn infant is due to fetal anoxemia resulting from maternal anoxemia. Under ether and cyclopropane, apnea seems to result from narcosis of the fetal respiratory center caused by the anesthetic gas itself. The comparatively low oxygen levels of most infants at birth are emphasized by all of the data obtained.

Factors Influencing the Appearance of Spasticity in Hemiplegias in Infancy. DR. RANDOLPH K. BYERS, Boston.

In a large clinic devoted to the care of patients with motor disturbances other than poliomyelitis, there have turned up recurrently children with hemiplegia on whom in early infancy a diagnosis of brachial palsy had been made by competent medical persons. This mistake has been encountered frequently enough to demand explanation. The records of a number of such children were examined, and it was found that the time when these palsies were noted varied a good deal; in a few instances the palsy was noted on the day of birth, but in most it apparently developed a few days or weeks after birth and was described as generalized or diffuse weakness, often with some active movement all through the arm. In a few, weakness of the leg was noted at or soon after the time it appeared in the arm, but in most the abnormality of the lower extremity first appeared as spasticity when the child began to walk. A few had marked symptoms of cerebral irritation in the neonatal period, but in most instances symptoms referable to the nervous system were lacking or very inconspicuous.

The age at which the paresis was observed to have become clearly cerebral and spastic varied from six months to eight years, but if 3 children who were not seen for four and one-half, five and eight years, respectively, are omitted, spasticity was observed between 6 months and 2½ years of age. In no instance was there any reason to believe that any damage to the nervous system had occurred subsequent to the original injury. ("Spasticity" as used here is defined as increased resistance to passive manipulation, accompanied by increased tendon reflexes and sometimes by clonus or Babinski's sign.) In 1 instance the involved arm remained hypotonic, but with increased reflexes, and the leg on the same side was spastic.

Langworthy has shown that when very immature animals are decerebrated, rigidity does not occur, but if young animals mature enough to exhibit normal gait and posture are used, decerebrate rigidity follows the operation. Kennard has shown that cortical ablations limited to the motor and premotor cortex of one side in infantile monkeys produce very few motor changes, but that more extensive

decortication in infancy is followed by paresis of the opposite extremities, and that unless extensive damage is done, the fine movements of the hand and forearm are more affected than any other part of the voluntary musculature. McNutt published observations on 2 human infants dying a few weeks after birth and exhibiting flaccid paralysis of an arm, who had extensive hemorrhage over the opposite cortex, one practically destroying the whole thickness of the cortex in the motor region.

In the present study is included a child seen at 6 days of age because of a weak right arm, in whom at the time of examination twitchings of the right side of the face were beginning to appear. On examination his right arm was generally weak and motionless, and his right leg was moved less well than his left, and though the tendon and plantar reflexes were normal, there was obvious loss of muscle tone in the left leg. Tapping of the subdural spaces produced considerable quantities of yellow serous fluid, and on exploration a subdural hematoma with organizing membrane was found overlying the left cerebral cortex and removed. At 7 months the infant appears to be normal.

Conclusion.—Lesions of the nervous system which cause spastic hemiplegia in childhood are manifest during early infancy, if at all, as flaccid paresis, most marked in the affected arm but usually discernible in the leg as well, if looked for.

DISCUSSION

Dr. Warren R. Sisson, Boston: I should like to ask Dr. Byers if he has any studies of anesthetics which were used in these cases. I think that question is quite pertinent in the light of Dr. Smith's paper. It takes such a very short time to cause cortical destruction from anoxemia that I wonder if the alteration in this case, the second case which he reported, might not be due to that cause.

Dr. Byers: I am not sure that I understand what Dr. Sisson meant. Did you mean the second patient whose brain was explored and nothing found?

Dr. Warren R. Sisson: Yes.

Dr. Byers: The history with relation to anesthesia was not obtained at the time, and I do not have any data on that. That baby was reported to have had a caput succedaneum at birth, but by the time I saw him, when he was 12 days old, there was no caput evident on the surface. Nobody could remember on which side it was, either.

Exacerbation in Chronic Glomerulonephritis. Dr. John D. Lyttle, Dr. David Seegal (by invitation), Dr. Emily N. Loeb (by invitation) and Dr. Elizabeth L. Jost (by invitation), New York.

Sixty-nine patients with chronic glomerulonephritis were observed for one to eight years, and the exacerbations occurring in the group were analyzed with the object of obtaining information concerning the factors responsible for the progressive nature of chronic glomerulonephritis. No patients with subacute nephritis were included. The observations include the incidence of exacerbations in the group, the presence and nature of any infection, the latent period preceding exacerbation and finally the immediate and subsequent effect of each exacerbation on the renal function.

It has been assumed that the development of an exacerbation in chronic glomerulonephritis is indicated by an abrupt marked increase in the hematuria.

Of 12 children under 14 years of age, 8 had 22 exacerbations; of 57 adults, 5 had 6 exacerbations. The conditions of observation were the same for each group. The frequency of exacerbation in the children may be due to the frequency of acute infection in children.

Each of the 28 exacerbations followed an infection. In 20, or 71 per cent, the infection was caused by the hemolytic streptococcus. In the entire group there were 322 other bouts of infection (15 per cent due to the hemolytic streptococcus) which did not precipitate exacerbations.

The latent period between the onset of the infection and the onset of the exacerbation was short—one to three days in the majority of cases. This is in contrast to the longer latent period seen with acute glomerulonephritis. This brief latent period is of interest in regard to the concept that in this disease the kidney is hypersensitive to bacterial products.

The status of the renal function was established by the usual tests, carried out under the conditions existing in routine hospital and clinic practice. The limitations and the difficulties of interpretation are recognized, and for the purpose of this study the tests are taken to indicate the relative rather than the absolute changes in renal function.

Eighteen of the 28 exacerbations in 13 patients produced a transient drop in renal function. Thirteen of these exacerbations followed infections with the hemolytic streptococcoccus. Ten of the 28 exacerbations failed to produce a demonstrable effect on renal function.

The failure of exacerbation to produce a permanent decrease in renal function was surprising to us. If persistent infection with the hemolytic streptococcus were the mechanism which caused progressive renal damage in patients with chronic glomerulonephritis, one would expect that the infection with the hemolytic streptococcus which induced an exacerbation of nephritis would be particularly effective in permanently reducing renal reserve. The analysis of our material lends little evidence for this concept.

It may be that our tests for renal function do not accurately reflect changes in the amount of functioning renal tissue. For instance, 3 exacerbations of nephritis produced 2 "transient" decreases and 1 "permanent" decrease in renal function. However, a reduction in the amount of functioning renal tissue occurred following the first 2 exacerbations, although we were unable to demonstrate this by the usual functional tests. An alternative hypothesis is the following: The velocity of the nephritis is established at the onset through an unknown cause. Exacerbations produce dramatic episodes but do not significantly alter the slope of the curve. We do not know which is the correct hypothesis.

Addis, in 1931, stated that in his experience none of the infections and incidents which led to temporary increases in the intensity of the renal lesion seemed to have resulted in any irreparable loss of secreting tissue. He further described 2 cases in which repeated exacerbations seemed not to be accompanied by a significant decrease in the "amount of functioning renal tissue." Winkenwerder, McLeod and Baker have shown "that recurring infections, in spite of their relation to exacerbations, do not necessarily determine the ultimate outcome of the disease, for partial recovery to the latent stage or complete recovery from nephritis was not prevented by such infection, and whereas the progressive group was characterized by recurring infections in some cases, in others, this factor was not obvious and in a few patients active infection was never demonstrated."

Summary.—In a group of 69 patients with chronic glomerulonephritis, closely studied for one to eight years, 13 patients experienced 28 exacerbations. Exacerbations occurred more frequently in the younger age group. The exacerbation in chronic glomerulonephritis is the result of infection, and this infection is due mainly to invasion by the hemolytic streptococcus. The chief effect of the exacerbation is a transient rather than a permanent decrease in renal function. But since there is no correlation between the results of tests of renal function and the mass of functioning renal tissue it is impossible to determine whether or not the total mass of renal tissue has been reduced in the cases in which tests of renal function indicate only a transient decrease in function.

DISCUSSION

DR. LEE E. FARR, New York: I should like to mention some observations at the Rockefeller Hospital as to the effect of exacerbations and intercurrent infections on chronic nephritis over a period of time.

The data have not been analyzed as in the cases studied by Dr. Lyttle and his associates, but in going over the data one gets the unmistakable impression that the rate of progression of the disease from adequate renal function to renal failure has not been influenced by the development of intercurrent infections while the nephritis has been chronic.

The infections which produced apparent exacerbations, manifested as increased albuminuria or hematuria, did not seem to play any significantly greater role in the production of renal failure or in hastening its appearance than did infection without apparent exacerbation.

Attempts to remove the foci of infection in these patients did not influence the outcome or the rate of progression of the nephritis.

I should like to ask Dr. Lyttle what he believes the significance of the common cold is in these patients. It is relatively easy for one to assay the possible effect of infections with the hemolytic streptococcus, because the organism is readily demonstrated, but so often in these patients one sees what is called an infection of the upper respiratory tract, and presumably it is the common cold. Do you believe that it has any significant role in the production of the exacerbations in which one sees hematuria and albuminuria, or do you think that that type of exacerbation is limited largely to infections in which bacterial organisms presumably are the etiologic agents?

Dr. Benjamin Kramer, Brooklyn: I was waiting to hear Dr. Lyttle say something about the relative mortality between these two types of chronic glomerulonephritis, i. e., between the patients with recurrent exacerbations in whom renal function is impaired and those with recurrent exacerbations in whom renal function remains unchanged.

One also has the impression that in certain cases there is little one can do to affect the course of chronic glomerulonephritis. Even when the patient is kept under supposedly ideal conditions hygienically and dietetically, i. e., in the hospital, over a long period, he either improves rapidly or goes downhill steadily in spite of what is done for him.

Dr. Mitchell I. Rubin, Baltimore: I should like to ask Dr. Lyttle regarding the interval of time between the exacerbations. Among the patients with acute glomerular nephritis whom my associates and I have observed we did not note any exacerbations in those whose urine had become normal as demonstrated by repeated Addis counts (the normal value for red blood cells being under 1,000,000) and whose blood sedimentation rate had become normal. In the average case, whereas on routine examination the urine had returned to normal within six to eight weeks, the Addis count and sedimentation rate had not returned to normal for four to six months.

We recently observed 2 children, one of whom had 3 and the other 4 recurrences. However, in the interval between these recurrences neither the Addis count nor the blood sedimentation rate had become normal.

Dr. Arthur H. Parmelee, Oak Park, Ill.: Apropos of the question of what determines whether nephritis will develop in a child or not, I should like to mention 3 children in a family which has been under my observation for the past eight years. One child had previously had acute nephritis, following scarlet fever; another had an attack of tonsillitis with cervical adenitis, followed by acute nephritis, when I first saw the family. About three months later the older girl, who had never had nephritis previously, contracted measles and with it acute nephritis. In due time the other 2 children came down with measles and also promptly had acute nephritis.

Since that time I have observed these children through five or six household colds, grip and tonsillitis, and each time their illness has been accompanied by hematuria and albuminuria, from which they have promptly recovered. Recently the child who previously had scarlet fever showed, following a severe throat infection complicated by nephritis, a further complication, erythema nodosum. There were no rheumatic symptoms, and the tuberculin test was negative.

Is it not possible that there are constitutional factors which determine these exacerbations, rather than the persistence of a focus of infection with the hemolytic streptococcus?

DR. LYTTLE: In answer to Dr. Farr, there was a high incidence of common colds in our group, but exacerbation following this type of infection was infrequent.

I cannot give a definite answer to Dr. Kramer's question, because the number of patients is so small. As far as our studies have gone, there is no difference in the mortality of that group which had a transient drop in function compared with those in whom the function remained normal.

In answer to Dr. Rubin's question, I should say that no patients with subsiding acute nephritis or subacute nephritis were included in this series. We have found that if the acute nephritis is entirely healed the subject can subsequently experience infection with the hemolytic streptococcus without recurrence of the nephritis. We have studied a large number of patients with this point in mind.

I quite agree with the last speaker that there are certainly other factors besides invasion by the hemolytic streptococcus or any other organism that determine the incidence of nephritis and of exacerbation and the progression of the disease. What they are, I don't know. They may be constitutional.

Acid-Soluble Phosphorus Compounds of Red Blood Cells in Diabetic Acidosis. DR. GEORGE M. GUEST and S. RAPOPORT (by invitation), Cincinnati.

The concentration of organic acid-soluble phosphorus compounds in the blood cells decreases rapidly during the development of acute diabetic acidosis, and after correction of the acidotic state returns to normal slowly. These changes occur mainly in the diphosphoglycerate fraction, which is decomposed under conditions of acidosis and resynthesized during recovery, through reactions of the glycolytic enzyme system. These changes are closely related to the shifts in the diffusible electrolytes of the blood cells and serum which occur during periods of acidosis and recovery. The restoration of the organic acid-soluble phosphorus compounds to normal concentration in the cells and the restoration of a normal electrolyte structure of the whole blood lag considerably behind what may be regarded as symptomatic recovery.

The excessive amount of phosphorus excreted in the urine during diabetic acidosis is probably derived largely from these labile phosphorus compounds of the blood and tissues. The slowness of readjustment of these substances to normal concentrations in the blood cells suggests that the phosphorus reserves of the body are thoroughly exhausted during the period of acidosis.

DISCUSSION

DR. ALFRED T. SHOHL, Mirror Lake, N. H.: I should like to ask Dr. Guest why he elected to give sodium bicarbonate and phosphate separately rather than as alkaline phosphate. I should like to ask him whether he can calculate the total deficit of the phosphorus stores of the body by their deposition during recovery; i. e., I should like to know whether he can compute the deficit produced by acidosis.

DR. ALEXIS F. HARTMANN, St. Louis: I am pleased to hear some one finally say that he thinks the time element in recovery from acidosis is important. I have been getting up here year after year to maintain that position. I think you are right, Dr. Guest!

I should like to ask, however, just how important you think it is to restore the reduced acid-soluble organic phosphate to permit at least clinical recovery, and also whether you have yet tried sodium lactate and compared its effect with that of sodium bicarbonate.

DR. GUEST: In reply to Dr. Shohl's questions I wish to emphasize the fact that much experimental work must be done before one can know the type of phosphate solution, and the amounts, that can be given advantageously in the treatment of this type of acidosis. The phosphate solution used in these pre-

liminary studies was the Sörenson mixture of sodium and potassium phosphates, p_H 7.38. The dose of sodium bicarbonate was calculated on the basis of body weight, to bring the alkali reserve of the blood to a normal level. The acidosis was corrected quickly by the administration of sodium bicarbonate, because resynthesis of the organic acid-soluble phosphorus compounds will not take place while the p_H of the blood is low. The administration of sodium bicarbonate and phosphate solutions separately rather than as a combined solution makes the preparation simpler and the treatment more flexible.

Whether the deficit in phosphorus can be calculated from the chemical data on the blood is doubtful. The losses of phosphorus from the body by urinary excretion increase with the severity and duration of the acidosis. Complete metabolism studies in animals studied during the development of diabetic acidosis may give information making possible such calculations.

I am glad that Dr. Hartmann emphasized again the importance of correcting the state of acidosis quickly. We have not used sodium lactate solutions, preferring to use sodium bicarbonate, with which we have had most experience.

Ascorbic Acid-Like Reducing Substance in the Buffy Layer of Centrifuged Oxalated Blood. DR. ALLAN M. BUTLER and MISS MARGARET CUSHMAN (by invitation), Boston.

Analysis of the buffy layer of centrifuged oxalated blood gives concentrations of an ascorbic acid–like reducing substance equivalent to from 29 to 43 mg. of ascorbic acid per hundred grams of buffy layer, or twenty-five to one hundred and fifty times the concentration of ascorbic acid in plasma. In leukemic patients the apparent ascorbic acid concentration of the buffy layer may be as much as 150 mg. per hundred grams, or as much as five hundred times the plasma ascorbic acid concentration of the same blood.

Samples from the upper portion of the buffy layer, in which platelets greatly outnumber the white cells, and samples from the lower portion of the buffy layer, in which the white cells predominate over the platelets, contain approximately the same concentration of reducing substance. Samples of almost pure platelets from the buffy layer from 2 patients with platelet counts from 500,000 to 1,000,000 following splenectomy and samples of almost pure white cells from spinal fluid and from the buffy layer from 2 patients with thrombopenic purpura have similar concentrations of this reducing substance.

The absence or presence of this substance in the buffy layer of guinea pigs fed diets deficient in vitamin C, containing from 0.0 to 1.0 mg. of ascorbic acid per day, coincided with the presence or absence of scurvy, as determined by Dr. Otto Bessey by histologic assay of scorbutic changes in the incisor teeth. The buffy layer from human subjects with scurvy or on a diet markedly deficient in vitamin C contained either none, or only traces, of this reducing substance. After the ingestion of vitamin C by such subjects the concentration of this substance in the buffy layer rose coincidentally with healing of the scurvy and before there was an appreciable rise in the ascorbic acid concentration of the plasma.

The time curve of reduction of 2,6-dichlorophenolindophenol by metaphosphoric acid filtrates of buffy layer from normal and leukemic subjects coincided with that due to ascorbic acid. Similarly, the reduction of methylthionine chloride (methylene blue) by such filtrates corresponded with that due to ascorbic acid. From such filtrates 2,4-dinitrophenylosazone could be crystallized, which in characteristics of precipitation and deep red color was similar to the osazone formed from solutions of crystalline ascorbic acid. The actual amounts of the osazone recovered from weighed amounts of buffy layer were from 45 to 30 per cent of that calculated from the apparent ascorbic acid concentration. The melting point of the osazone from the buffy layers of 2 normal and 4 leukemic subjects varied in individual samples from 244 to 252 C. (uncorrected), with the range of melting for any one sample being 2 degrees or less. The recovery from pure ascorbic

acid solutions was 70 per cent of the theoretic amount, and the melting point ranged in 5 samples from 249 to 254 C. (uncorrected), while 1 sample gave a melting point of 261 C. Such a variation in melting point with crystalline ascorbic acid solutions has been reported in the literature. No such osazone could be obtained from such filtrates in the case of a vitamin C–deficient subject whose buffy layer contained no measurable amount of this reducing substance.

Thus the data at hand, though not conclusively establishing the identity of this reducing substance in platelets and white cells, satisfy the criteria which have been relied on in identifying a reducing substance in the plasma as ascorbic acid.

Conclusions.—The physiologic and chemical evidence presented suggests that:

1. The platelets and white blood cells of guinea pigs and human beings normally contain a reducing substance, the concentration of which is dependent on the vitamin C nutritional state.

2. The same reducing substance may appear in the platelets and white cells of leukemic patients in higher concentration than is found in normal subjects, in spite of low plasma levels.

3. This reducing substance is either ascorbic acid or a substance metabolically associated with it.

4. For persons not suffering from infection or leukemia, the apparent ascorbic acid concentration in the buffy layer of centrifuged oxalated blood provides an index of vitamin C that extends beyond the range provided by fasting plasma ascorbic acid concentrations.

Finally, the accumulating data on patients lead us to believe that absence of this reducing substance from a buffy layer indicates a vitamin C deficiency that is affecting or seriously threatening normal physiologic function and histologic structure.

Second Session

Thursday Evening, May 2

Hyperthyroidism in Children. Dr. Charles Gilmore Kerley, New York.

The outstanding symptom in the group of cases observed was a change in the behavior pattern. The child gradually became excessively nervous, highly emotional and quarrelsome; fits of temper and hysterical seizures were frequent and a common complaint was "that the child had become increasingly difficult to live with." The school reactions showed lack of concentration and insubordination. In girls the mother-daughter complex was frequently present. An anxiety syndrome was occasionally observed. Concurrent manifestations were enuresis, hyperhidrosis, sleeplessness, headache, moderate elevation of the temperature, 100 to 101 F., and a wide range of digestive disorders, in which anorexia and recurrent vomiting were the most prominent.

Tachycardia was present in 94 children (90.4 per cent)—in the majority, above 120, with slight abatement during sleep. The thyroid gland was definitely enlarged in 64 (63.5 per cent); 10 children who failed to show tachycardia belonged to this group; pronounced exophthalmos was present in 9. Determinations of blood pressure and of the basal metabolic rate were useful in only a limited number of cases, because of the highly emotional state of the patients. In 24 of the 104 cases there was positive proof of hyperthyroidism in the mother or in the immediate family. The nervous and emotional reactions and the persistent tachycardia during sleep as well as when awake should always be looked on as symptoms suggestive of hyperthyroidism. Petit mal was the immediate occasion for the consultation in 4 girls.

Therapy consists in the use of iodine in the form of an iodized salt or of compound solution of iodine (Lugol's solution), invariably in small doses, 2 to 4 mg. daily; otherwise the treatment is to be governed by the age of the patient, the physical findings and the nature and degree of the nervous instability.

Hypothyroid Epiphysial Dysgenesis. Dr. Lawson Wilkins, Baltimore.

This article will be published in full, with discussion, in a later issue of the American Journal of Diseases of Children.

Certain Effects of Hemophilia in the Growing Skeleton. Dr. John Caffey (by invitation) and Dr. Edward R. Schlesinger (by invitation), New York.

Mention is made of the paucity in pediatric literature of roentgen observations on skeletons of preadolescent hemophiliacs despite the fact that few infantile or juvenile bleeders escape hemarthroses.

The roentgenographic findings in 5 children with hemophilic hemarthroses are reported. These findings include localized accelerated maturation of the epiphyses, dysgenesis of the epiphyses, panarthritis with the deposition of iron in periarticular tissues, erosions of the articular margins of the bones, intraosseous hemorrhage, subchondral hemorrhage and subperiosteal hemorrhage. It is pointed out that subchondral hemorrhage into the proximal epiphysis of the femur may produce coxa plana and deformity of the shaft of the femur, similar to the changes found in so-called Perthes' disease.

An attempt was made to induce chronic hemarthroses in growing rabbits by repeatedly injecting blood into joint cavities. Although necropsies demonstrated that the injected blood was in the joint spaces, there was no localized acceleration of epiphysial maturation.

Bilirubinemia in the Newly Born. Dr. Leonard T. Davidson (by invitation), Dr. Katharine K. Merritt (by invitation) and Dr. A. Ashley Weech, New York.

The methods for the determination of bilirubinemia in infancy were unsatisfactory up to 1936 and 1937, when Evelyn, and Malloy and Evelyn published articles in which they described an accurate photoelectric method for both direct and indirect estimation of bilirubin in serum, in which the precipitation of protein and the consequent loss of bilirubin by adsorption were eliminated. They felt that the interference of yellow serum pigment in the determination by color had been overcome by the use of a specially selected light filter, which also eliminated the necessity for artificial color standards.

These more accurate methods stimulated us to investigate further the problem of icterus neonatorum. Our purpose was to define quantitatively in terms of the van den Bergh reaction the character of the serum bilirubin in icterus neonatorum, with a view to understanding the nature of this condition and differentiating it from other forms of jaundice in the newly born.

In order to study daily changes in the concentration of bilirubin in the serum of the newly born, a new method of analysis was developed, which permits the determination of total serum bilirubin on 0.7 cc. of capillary blood.

Three groups of newly born infants have been studied. Daily estimations of serum bilirubin were made throughout the neonatal period (approximately two weeks) on (*a*) 63 infants in whose cases the cord blood was obtained for a determination of serum bilirubin, (*b*) 11 infants in whose cases no cord blood was obtained but whose blood was studied beginning on the first day of life, and (*c*) 27 infants whose blood was studied as soon as clinical icterus was observed. A limited number of infants were followed over a period of several weeks, until the serum bilirubin became normal.

The relationship between the concentration of serum bilirubin in cord blood and the subsequent course of bilirubinemia will be analyzed.

The age at which bilirubinemia reaches its peak will be discussed. In general, it has been found that this peak occurs at the age of three to five days in those infants in whom the most severe bilirubinemia develops. Infants who show a milder degree of bilirubinemia present the maximal elevation earlier.

The data provide a series of normal values which define the range of the serum bilirubin level for each day of the neonatal period and for some weeks thereafter. The relationship between the degree of bilirubinemia and the time required for the serum bilirubin to return to a normal level will be considered.

The results will be correlated with the degrees of jaundice of the mucous membranes, scleras and skin. It has been found that icterus cannot be detected clinically until the serum bilirubin has exceeded 5 mg. per hundred cubic centimeter of blood and that after severe icterus clinical signs are no longer in evidence when the serum bilirubin has fallen below this level.

The direct and indirect findings in regard to the actual amounts of bilirubin in physiologic icterus with the use of the quantitative method will be presented in contrast to the results obtained in a few cases of jaundice of pathologic origin.

DISCUSSION

DR. BÉLA SCHICK, New York: Dr. Merritt was so kind as to mention my name in connection with the problem of jaundice in the newborn child and my theory about it.

It is a fact that the hemoglobin of the mother is the only source supplying the embryo with the iron necessary for the production of the latter's hemoglobin. Whereas protein and mineral substances are present in the serum of the mother, and therefore easily accessible to the embryo, the hemoglobin is not available without destruction of the red cells of the maternal blood.

I found in the literature many remarks about the visible destruction of maternal blood in the placentas of animals; the most striking example is the placenta of the dog, which shows a green border.

The dog's placenta was studied very carefully. At first hemorrhage is established. The maternal hemoglobin is split into an iron-free compound and an iron compound at the site of the hemorrhage. The absorption of the iron compound supplies iron to the dog fetus. The iron-free part (biliverdin) and bilirubin remain in the placenta. Icterus neonatorum in a dog is represented by this green border of the placenta, consisting mostly of biliverdin.

One knows that premature infants, who show icterus neonatorum more frequently and more intensively, have more iron in their placentas than mature infants. Wagner, who studied this with me, found not absolute values but percentage values showing higher iron content in the placenta of the premature infant than in the placenta of the infant born at normal term. We were later forced to take not only the placenta into consideration but also the liver of the fetus.

It is interesting to note that old time physicians called the placenta the *jecor uterinum,* with the idea in mind that the placenta has the function of the liver. In the human placenta no green border is found; one cannot prove so easily the destruction of hemoglobin. I believe that the human placenta starts the hemolysis and that the liver completes it.

There is no doubt in my mind that the jaundice of the newborn child is a physiologic phenomena. It has to occur. It is a transitional thing, a by-product of the supply of the fetus with the amount of iron necessary for the production of hemoglobin in the red cells and muscles. The more frequent occurrence of icterus in premature infants is due to the fact that the birth of the premature child falls into just that period when this transportation of cleavage products of the mother's hemoglobin is at its height, whereas in more mature infants one finds less icterus. I have frequently found that the child born by cesarean section performed under strict indications is overdue. Such an infant has no visible icterus or hardly visible icterus. The transport of split products of maternal hemoglobin is already finished, and therefore jaundice is rarely seen in the child delivered by cesarean section.

DR. WEECH: The findings in this study have brought out a riddle for which we do not know the answer. When hemolytic disease occurs in older children,

icterus of the skin and scleras becomes clinically manifest when the amount of bilirubin in the serum reaches a level of about 2 mg. per hundred cubic centimeters. In most newly born infants with physiologic hyperbilirubinemia jaundice does not appear until the level is well above 2 mg.; even with levels as high as 5 mg. only half of the infants will be icteric. At first thought one might imagine that jaundice is absent in many of these infants only because the process is acute and does not allow time for the bilirubin to diffuse from the blood and stain the skin. Apparently, however, this is not the explanation. Repeatedly, we have observed, during the declining phase of physiologic bilirubinemia, the disappearance of jaundice when the level was still 4 or 5 mg.

Sulfamethylthiazole. DR. ALEXIS F. HARTMANN and MISS ANNE M. PERLEY (by invitation), St. Louis.

Sulfamethylthiazole (2-sulfanilamide-4-methylthiazole) has been used in approximately 150 cases of various infections. Our present impressions of the value of the drug may be summarized as follows: In all types of pneumococcic infections except meningitis it seems to be at least equal in value to sulfapyridine (2-[paraaminobenzenesulfamido]-pyridine). In meningitis it may prove inferior to sulfapyridine, because it diffuses less readily into the cerebrospinal fluid. A similar situation seems to hold relative to infections with the hemolytic streptococcus. Because of the greater ease of parenteral administration, sulfanilamide will probably still be the drug of choice in the treatment of streptococcic meningitis. In staphylococcic infections the picture is still uncertain. We have had frank failures, in which we were unable to sterilize the blood stream and to prevent progression of staphylococcic infection. On the other hand, we have observed a number of cases in which the drug seemed to be of considerable value. At the moment we are not impressed with any great superiority of sulfamethylthiazole over sulfapyridine in the treatment of staphylococcic infections. Sulfamethylthiazole causes considerable less nausea and vomiting than does sulfapyridine. It also produces less methemoglobinemia and cyanosis. No troublesome hemolytic anemia or leukopenia has been encountered, nor has peripheral neuritis been noted as yet, such as has been described in adults.

Our present studies with sulfathiazole indicate no essential difference between the two drugs.

DISCUSSION

DR. CHARLES HENDEE SMITH, New York: My colleagues and I had hoped that sulfamethylthiazole was going to be as much better in pneumonia as sulfapyridine was better than sulfanilamide, but we have been a little disappointed.

The incidence of pneumonia this season has been very light, and we have used this drug in only about 20 cases. When the scare about multiple neuritis came, we gave it up, partly for that reason and partly for a reason which I should like to show on a slide (slide shown).

Of 20 cases in which we tested sulfamethylthiazole, in 10 the crisis occurred in twenty-four hours and in 3 in thirty-six hours—just the classic drop. We had failures, however, in 5 cases of lobar pneumonia and in 1 of bronchopneumonia (which was rather to be expected, because sulfapyridine does not do much good in bronchopneumonia), and we also observed a relapse. This is a brief chart of the one relapse, showing sulfamethylthiazole given in rather full doses, 2 Gm. a day, to a child of under 10 Kg. The temperature came down, but when the administration of the drug was stopped the temperature went up again. There was no apparent effect thereafter, although the child did get well on his fifteenth day. That was an 11 month old child with pneumonia due to pneumococcus type XIV, a type which is common in New York and which produces severe pneumonia.

We have seen no such relapses nor such continued fever after stopping sulfapyridine therapy, even when this drug was given for only one or two days after the crisis.

Here is the chart of another child who was given the drug for four days and whose temperature came down on the seventh or eighth day—nothing very dramatic about it. I think one could say it indicates a relative failure.

Another desperately sick child of 8 months, weighing 19 pounds (8.5 Kg.), with pneumonia due to Pneumococcus type XIV, was given the drug over many days, from the eighth to the eighteenth day. He did not get well until he was given serum, because he was so desperately sick. I think that that can be put down as a failure.

Another infant did not improve much on sulfamethylthiazole but got well as soon as he was given sulfapyridine in the usual way.

We have not been able to get high blood levels of this drug, for some reason, even with a higher dosage than that Dr. Hartmann recommended. We have given it in the same way as sulfapyridine and have tried to limit the fluid intake when the blood level of the drug was low, but the blood levels are not as high as we can get with sulfapyridine. That probably accounts for the failures.

I want to say one good word for this drug. We had a very dramatic case, I think, of a child with chronic bacterial endocarditis, whose blood was sterilized with sulfapyridine but who became sensitive to it, so that a high fever and a rash developed whenever a dose was given. She has been given sulfamethylthiazole now for several months without having a reaction. Apparently this drug can be given for a longer time than sulfapyridine. Later, however, the infection of the blood stream and the fever returned.

Dr. Clifford G. Grulee, Evanston, Ill.: My colleagues and I had a little experience with sulfathiazole in a small series of cases that were not at all similar to those presented by Dr. Hartmann.

The first case was one that was very striking. The baby came into the wards when it was 2 months old, with a subaponeurotic hematoma, which was infected and yielded cultures at that time of both Streptococcus haemolyticus and Staphylococcus. We prescribed sulfanilamide, and the streptococcus disappeared but the staphylococcus remained. For a total of nine months thereafter that child had repeated infection.

As near as we can estimate, we opened between four and five hundred abscesses and boils on this child. Her general condition did not seem to be adversely affected, but we found nothing that caused any change in the infection of the skin.

Then I got some sulfamethylthiazole, and we gave that in approximately the dosage which Dr. Hartmann mentioned, and within two or three weeks that infection was practically cleaned up. I thought things were going nicely. We did, however, watch the blood carefully and at about the end of the second period of treatment we found that the child had only 5 per cent neutrophils with leukopenia, so we stopped the therapy entirely. About a week after that, this child got an acute streptococcic infection of the throat and died with a typical picture of agranulocytosis. The condition of the skin had entirely cleared up.

The second case was that of a baby that came in with about twelve boils on the back of its head and one on the front. The one on the front side of the head was of such a nature that the eye was swelled closed. We opened one of these boils to find out what the organism was, and it proved to be Streptococcus haemolyticus. That eruption cleared up in four or five days absolutely, without any further opening of this abscess.

The third case was one in which an eruption was cleaned up in exactly the same way, but the patient had a toxic rash. I have seen very little said about the use of this drug in treating superficial infections like furunculosis, but I have never seen anything that clears up furunculosis the way it does.

Dr. Henry F. Helmholz, Rochester, Minn.: I was particularly interested in the cases in which Dr. Hartmann tried this drug in the treatment of urinary infections.

My associate and I have used both sulfamethylthiazole and sulfathiazole in the treatment of these infections, and as sulfathiazole is excreted more rapidly, we feel that, of the two drugs, it will probably be the preferable one. With two thirds of the dose that Dr. Hartmann has given, sulfathiazole was present in concentrations up to 300 mg. per hundred cubic centimeters of urine. Possibly we did not force fluids as is ordinarily done.

The outstanding feature of these two drugs as compared with sulfapyridine and sulfanilamide is their bactericidal action on Streptococcus faecalis. Their use in combating urinary infections is therefore preferable to the use of sulfanilamide when the infecting organism is not known.

We have seen 2 cases of peripheral neuritis complicating the use of sulfamethylthiazole.

DR. HARTMANN: I am sure there will be many discrepancies clinically because no one has had a large experience yet with this drug. For instance, Dr. Smith was much encouraged by his experience with Streptococcus viridans endocarditis in the 2 instances in which he used the drug for that disease. We had absolute failures in our 2 cases.

You might be interested, however, in a summary of the toxic symptoms which we have encountered and in the statement by Dr. Rice on all of the cases of peripheral neuritis reported to date.

1. Occasional nausea and vomiting but *no marked* vomiting (much less than with sulfapyridine)

2. Methemoglobinemia sufficient to cause cyanosis seen frequently (comparable to effect of sulfapyridine)

3. No sulfhemoglobinemia

4. No severe hemolytic anemia, but some tendency toward milder states of anemia (comparable to sulfapyridine)

5. No agranulocytosis, but some tendency toward leukopenia (probably less than that with sulfapyridine)

6. Rash (morbilliform) in 5 cases

7. Fever in 1 case

8. No gross hematuria; microscopic hematuria in 2 cases, probably not related to the drug

9. Foot drop, bilateral, in 1 case, developing after the administration of approximately 120 Gm. in three courses of 40 Gm. each. The peripheral neuritis is improving.

A New Method for Estimating the Physical Development and Nutrition of School Children. DR. NORMAN C. WETZEL, Cleveland.

A new method to aid an examiner in the determination of physical fitness among children of school age has been described.

The method, first of all, is practical. It requires simply inspection of a graph plotted from ordinary routine measurements of height and weight on a specially designed grid network consisting of seven adjacent diagonal channels.

The grid has been calibrated to provide the following information: The line segment between consecutive height-weight points defines the course and the amount of development; the slope of the segment with respect to the network denotes either "over," "normal" or "under" nutrition, as the case may be, and the projection of the curve on the channel axis measures the change in physique or body build accompanying development. The end point of the segment represents the physical status, wherein the combined effects of growth, development and nutrition are embodied and cumulated to the latest observation.

Growth and development under all conditions are extremely regular; for even among the so-called nonlinear types the curve representing several years' develop-

ment prefers a straight line path. It changes direction when conditions in the external or the internal environment have changed.

In the several large series thus far studied, 65 per cent of the boys and 55 per cent of the girls progress in linear fashion for from five to fifteen years and even longer. The average of the mean slopes is 2.3, with a standard deviation of 0.2. This slope corresponds to an angle of inclination of 70° 21′. A more important result, however, is the slope (2.8082 ± 0.0035) of the line representing 1,178 observations for 116 boys, all of whom remained within the narrow limits of the middle channel throughout their developmental course of ten years or more. This small standard error signifies that healthy children tend to remain within 44′ or 0.73° of their true course. The correlation between height and weight thus becomes 0.97+.

Deviations from the normal are therefore easily displayed and measured, since the channel width allows for natural variations of ± 2.5 per cent.

Initial steps for inquiry along dietetic, endocrinologic and genetic lines are thus suggested for those children whose curves are "unsatisfactory" in one respect or another.

Children who remain in the same channel for the duration of adolescence need not reach equal developmental levels at the same age; there may be as many as six years difference, with some ahead of and others behind the level of advancement which 67 per cent of all children attain.

As a rule, an advanced or a retarded start is maintained throughout the ten to twelve school years; only in the exceptional child does the original age advance become altered. The retarded children thereby become marked out for intensive medical examination.

The geometric position of points located in various portions of the grid has been correlated with physicians' estimates of physical and nutritional status, and the several important zones denoted by the terms "overnourished," "stocky," "good," "fair," "borderline" and "poor" have been demarcated.

In the present series, 12,000 sets of measurements on 2,023 Cleveland school children have thus been compared with clinical appraisals of physical status. The gross agreement in the two methods is 87.5 per cent, which significantly exceeds the 60 to 65 per cent reported by other authors. Half the discrepancies occurred among children whose curves and points fell into the channel called "fair." These are the children on whom physicians find it difficult to agree in more than 50 per cent of cases.

In other words, the grid selects those in the overnourished, fair, borderline and poor groups who require additional and more intensive examination than that afforded by the routine check-up. Finally, it also selects those children who are "not doing as well as might be" even though they are placed, as regards physical status, in the group called "good."

As a further check, the method has been tested on the 15,000 sets of paired measurements contained in the large series of longitudinal data reported by Dearborn and his co-workers from the materials of the Harvard study of growth, on the data from several smaller series and finally against the mean values of over 400 reports in the literature dealing with growth and nutrition of large groups of children under various conditions.

The frequency distributions of physical status as defined by this objective method are practically identical in all data thus far examined. Broadly, 72 per cent of boys and 60 per cent of girls are well nourished; the physical status of 10 and 16 per cent, respectively, is "fair," "borderline" and "poor"; the remainder are either definitely overnourished or of the stocky, lateral type of body build. Apart from food and nutrition, economic, social and racial factors appear to be the most significant elements which influence these distributions.

DISCUSSION

DR. HAROLD C. STUART, Boston: I feel that Dr. Wetzel deserves to be complimented on his striking demonstration of an important feature of the growth of

young children. His method calls particular attention to the fact that growth is very orderly in the majority of instances and that it is worth while to take a few measurements and plot them regularly. It is thus possible to recognize the direction of a child's growth curves and to see whether or not his growth is as orderly as might be expected.

I rather wish that Dr. Wetzel had not used the word "nutrition" in quite the way he did in this connection, for he implied that the children who grow in another than linear manner are suffering from undernutrition or overnutrition, with important implications as to diet. My co-workers and I have for some time plotted the measurements of children on a "percentile rank" basis, a method by which the same rank plots a straight line. This procedure has had somewhat the same purpose as Dr. Wetzel's method. We have been impressed with the fact that during certain periods some children tend to rise out of their customary percentile ranks in certain measurements and even to progress far out of line for a time, and then they gradually drift back into their original ranks. Others will fall behind for a time and then climb up to their original positions.

This type of irregularity does not always seem to be related definitely to nutrition from the standpoint of what we know of their dietaries. It seems rather to be a phase of growth through which these children pass. Furthermore, when one analyzes the growth of these children on the basis of the amount that is contributed to weight by the growth of bone or muscle or of skin and fat, as revealed by roentgen films, one finds that a child may increase in rank in respect to body weight while actually losing in amount of fat and subcutaneous tissues. In other words, children may go through periods of exceptionally rapid growth of muscle or of bone and yet not store fat; they may even lose subcutaneous tissue.

I believe that the method devised by Dr. Wetzel for plotting growth trends is most valuable, for it is highly desirable to follow the growth of children in some such way, but we have to be careful in interpreting unusual trends as indicating excessive intake of food or lack of food without knowing more about these children than their height and weight.

DR. HENRY J. GERSTENBERGER, Cleveland: I should like to ask you, Mr. President, to request Dr. Wetzel, when he answers Dr. Stuart, to say what he has in mind in connection with the further study of school children in Cleveland.

DR. WETZEL: Dr. Stuart has raised a very important point—the point of definition.

Just the other day, in one of the local meetings having to do with the local situation in which we in Cleveland happen to be interested, the question of defining the term "malnutrition" came up. Dr. Gerstenberger and I have felt for a long time, as undoubtedly many here also have, that the term "malnutrition" is essentially a misnomer. That does not necessarily imply, however, that the term "nutrition" is a misnomer, and I am sure that Dr. Stuart did not intend to give that meaning.

However, it does focus attention on an important phase of all this work on growth and development, namely, the definition of terms. We have used these terms up to date provisionally, and nutrition, for example, will be involved when there is a deficiency in the diet or when there is an excess in the diet, or even when there is an adequate diet. Nutrition, through these studies, has become to us something more than just a simple process. It seems that the best we can do at present is to say that nutrition is that natural process by which children are permitted to develop along the contour lines of their own physique.

I grant Dr. Stuart at once, for example, that there is some question of whether an element of nutrition or an element of over or under feeding essentially is involved. That, of course, would have to be differentiated by further examination. But certainly our original purpose here was to do something in a preliminary way that would allow the school physician, with the help that he has, with the difficulties that he has, quickly to select those patients or those children who seem to be in greater need of examination from the rest of the group.

For example, the original discrepancies of 2 per cent and 19 per cent of so-called malnutrition that, one might say, lit the match to this study, reconciled themselves in the series, and, on the whole, we should say that probably 5 to 6 to 7 per cent are really malnourished in the broad sense of the term—in the ordinary, the layman's sense of the term—but that, on the other hand, 15 per cent of the children, broadly speaking, should be put to a more extensive examination. It is along that line that Dr. Gerstenberger has in mind to bring up, I think—and if I don't happen to touch on them, I hope he does, if he will be permitted to do so, Mr. President—many of these points which are just opening up to us. Whether or not we shall continue to retain the term "nutrition" for the angular deviation from the slope of these channels, I am not exactly willing to promise, but certainly so far as the geometric and mathematical effects of this particular problem are concerned, the closest tie that we can get with our work and that of the school physician is to use the term "nutrition"' and use it rather broadly for the moment.

Is there another point, Dr. Gerstenberger, that you wished me to touch on? I wish you would take it up from here.

DR. HENRY J. GERSTENBERGER, Cleveland: I simply wanted Dr. Wetzel to say that we have in mind studying another 18,000 children. We have 200,000 school children in Cleveland, and he has studied the records of 2,000. We wish to increase that number to 20,000, and we consider today's presentation a preliminary contribution.

If the scheme or the plan works, and he and the rest of us in Cleveland think it will, it is going to simplify very much the selection, as he just said, of school children that need to be studied more intensively. We certainly appreciate that it is impossible for communities to finance thorough examination of all school children, and yet if we do examine them, we ought to try to examine them well. We will do that best if we examine only those who really need to be examined.

In closing, I should like to compliment Dr. Wetzel very highly for the work that he has done, and those who know about this kind of work will realize that it has taken a tremendous amount of effort. I might also say that the movie is not a professional movie; it is an amateur movie, made by Dr. Wetzel and a couple of the men of the University Hospital's staff.

(To Be Concluded)

Book Reviews

Diagnosis and Treatment of Diseases of the Esophagus. By Porter P. Vinson, M.D. Price, $4.00. Pp. 224, with 98 illustrations. Springfield, Ill.: Charles C. Thomas, Publisher, 1939.

Here is another Charles C. Thomas book with the clarity and precision of type characteristic of this publisher. The book is timely, is well presented and should be enthusiastically received by the internist. It is a compilation of practical methods of handling various disorders of the esophagus. One is constantly delighted with the expressive freehand drawings, adequate photographic illustrations and clear reproductions of the roentgenograms. The text is readable and full of useful references gained from long experience. On the whole, emphasis seems to have been well placed. The use of a conversational method of presentation and the lack of a more complete discussion of pathologic physiology and anatomy are the only major faults of an otherwise adequate monograph.

Sixteen chapters cover completely all of the problems usually encountered in the diagnosis of esophageal disorders. The discussion of hysterical dysphasia, given with a matter-of-factness which will completely disarm the reader, is hardly convincing to the trained gastroenterologist, who must be alert to newer methods of nutrition and thoroughly conversant with the older conceptions of psychoneurosis. A reference to the classic on psychoneurosis by Dejerine might well have been included in this chapter to aid in a more adequate approach to the management of a somewhat difficult and frequently encountered disorder.

The bibliography following each chapter is well prepared for both student and teacher. It is with some disappointment that the name of Sippy, a pioneer in disorders of the esophagus, is not found in this otherwise complete bibliography. The text is replete with details of the management of various esophageal disorders. The reviewer is particularly impressed with the description of meticulous details of the handling of the examination and the dietetic and instrumental management of the patient.

In the introduction the author states his desire to make the general practitioner proficient in the treatment of these disorders, which is, perhaps, more than can be hoped, but thorough and accurate attention to details in observation and diagnosis will certainly result in a fuller appreciation of the problems of deglutition.

Congenital Cleft Lip, Cleft Palate and Associated Nasal Deformities. By Harold Stearns Vaughan, M.D., D.D.S., F.A.C.S. Price, $4.00. Pp. 210, with 259 illustrations. Philadelphia: Lea & Febiger, 1940.

This monograph by Harold Stearns Vaughan presents a condensed yet thorough review of an all-important field of plastic surgery. The early chapters, on the anatomy and embryologic development of these congenital defects, are brief but to the point; the subject matter is well supported by numerous illustrations. The discussion of the surgical management of these conditions includes short descriptions of most of the conventional operations, together with a more extensive presentation of the author's favored procedures. The chapter on reconstruction of the lip is particularly fine; the material is evidence of a thorough mastery of this field of surgery and is presented in a manner which even the uninitiated should understand. It might have been well, however, to sound a warning to the casual operator in this field, lest he be tempted to substitute one of these excellent drawings for experience.

In his preface Dr. Vaughan states that his book is intended for the general surgeon, the pediatric surgeon and the specialist in reconstructive surgery. A more detailed account of recommended procedures might have been helpful to the occa-

sional operator. However, into this complicated and highly specialized field it would seem unwise for any but the specially trained to venture. More space might have been given to postoperative management and complications, but any paucity in text is more than compensated for by the many fine illustrations, which lend clarity and simplicity to an otherwise difficult and complicated subject matter.

This book can be recommended enthusiastically to those interested in plastic surgery. It should prove an excellent reference book.

A Symposium on the Blood and Blood Forming Organs. By various authors. Price, $3.50. Pp. 264, with 90 illustrations and 22 tables. Madison: University of Wisconsin Press, 1940.

This book is composed of the collected papers read at the Institute for the Consideration of the Blood and Blood-Forming Organs held at the University of Wisconsin in September 1939. The various subjects and their authors are as follows: Some Historical Aspects of Hematology, E. Meulengracht; The Porphyrins and Diseases of the Blood, Cecil J. Watson; Aplastic Anemia, C. P. Rhoads; Anemia Due to Iron Deficiency, Clark W. Heath; Anemias of Nutritional Deficiency, George R. Minot; The Erythroblastic Anemias, Louis K. Diamond; Some Etiological Factors in Pernicious Anemia, E. Meulengracht; The Nature of Hemolytic Anemia, Russel L. Haden; Experimental Leukemia, J. Furth; Monocytic Leukemia and Subleukemic Leukemia, Claud E. Forkner; The Present Status of Hodgkin's Disease, E. B. Krumbhaar; The Reticulo-Endothelial System, Charles A. Doan; Hematologic and Pathologic Aspects of Infectious Mononucleosis, Hal Downey; Polycythemia, Paul Reznikoff; Marrow Cultures, Edwin E. Osgood; The Present Status of the Blood Coagulation Problem, Harry Eagle.

These subjects are all well discussed and well written. In every case the full aspect of the problem is completely covered. Any one wishing the latest developments in any of these subjects should read this book.

Vitamin D: Chemistry, Physiology, Pharmacology, Pathology, Experimental and Clinical Investigations. By C. I. Reed, H. C. Struck and I. E. Steck. Price, $4.50. Pp. 389, with 13 illustrations and 36 tables. Chicago: The University of Chicago Press, 1939.

This monograph on vitamin D is as comprehensive as the title suggests. Results of experimental investigations covering almost every field of research on this vitamin and related compounds are presented. To investigators, particularly those employing animal experimentation, such a compilation of recent work is of much interest and value. To the clinician, this brief glance at the staggering array of experiments and conflicting opinions is likely to be confusing. The dosages discussed throughout the greater part of the book are of an order of magnitude to the pediatrician's doses as the national budget is to his personal one. Yet for all this and perhaps because of it, the pediatrician who reads will profit.

The 48 pages, in small print, of bibliography for this 321 page book are of immense value to any one interested in the subject.

Text Book of Nervous Diseases. By Robert Bing, translated and enlarged by Webb Haymaker from the fifth German edition. Price, $10.00. Pp. 838, with 207 illustrations (9 in color). St. Louis: C. V. Mosby Company, 1939.

This book is a delightful text that covers anatomy, pathology and treatment of the nervous disorders. It is a translation and consequently has a strong European flavor, but the translator, Dr. Haymaker, was granted the privilege by Dr. Bing of revising and rearranging portions of it; so the book is also consistent with the American viewpoint. It is truly international.

The last chapters on psychoneurosis (although they may not be accepted wholeheartedly by psychiatrists) reflect a remarkably sane middle point of view that should delight most pediatricians.

Directory of Pediatric Societies*

INTERNATIONAL

International Association of Preventive Pediatrics

President: Prof. S. Monrad, Dronning Louises Børnehospital, Copenhagen, Denmark.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

International Congress of Pediatrics

American Committee:

Chairman: Dr. Henry F. Helmholz, Mayo Clinic, Rochester, Minn.
General Secretary: Dr. Kenneth D. Blackfan, 300 Longwood Ave., Boston.
Assistant Secretary-Treasurer: Dr. Charles F. McKhann, 300 Longwood Ave., Boston.

Canadian Committee:

Chairman: Dr. Alan Brown, Hospital for Sick Children, 67 College St., Toronto.
Secretary: Dr. H. P. Wright, 1509 Sherbrooke St. W., Montreal.
Place: Boston, Mass. Time: Postponed indefinitely.

International Congress for the Protection of Infancy

Secretary: Prof. G. B. Allaria, Corso Bramante 29, Torino 120, Italy.

FOREIGN

Argentine Pediatric Society of Buenos Aires

President: Dr. Martín Ramón Arana, 1809 Rodriguez Peña, Buenos Aires.
General Secretary: Dr. Alfredo Larguia, Cerrito 1179, Buenos Aires.

British Paediatric Association

President: Prof. Charles McNeil, 44 Heriot Row, Edinburgh, Scotland.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

Danish Pediatric Society

President: Dr. E. Lenstrup, Copenhagen.
Secretary: Dr. E. Gjørup, Dronning Louises Børnehospital, Copenhagen.

Paediatrický Spolok na Slovensku

President: Dr. A. J. C. Chura, Lazaretská 11, Bratislava.
Secretary: Dr. P. Rados, Lazaretská 6, Bratislava.
Place: Pediatric Clinic, University Bratislava. Time: Six times a year.

Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. E. A. Cockayne, 98 Harley St., London, W. 1, England.
Secretary: Dr. R. Lightwood, 86 Brook St., London, W. 1,. England.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:15 p. m.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

PALESTINE JEWISH MEDICAL ASSOCIATION, SECTION OF PHYSICIANS OF CHILDREN'S DISEASES

President: Prof. S. Rosenbaum, 26 Bialikstr., Tel Aviv.
Secretary: Dr. A. Brünn, 9 Maazestre, Tel Aviv.

SOCIEDAD CUBANA DE PEDIATRÍA

President: Dr. Clemente Inclan Costa, Manrique 48, Habana.
Secretary: Dr. Serafin Falcon Lopez, Calle B No. 356, Vedado, Habana.
Place: Cátedra de Clinica Infantil, Hospital Mercedes, Habana. Time: Last Wednesday of every month.

SOCIEDAD MEXICANA DE PEDIATRIA

President: Dr. Jorge Muñoz Turnbull, Av. Alvaro Obregón 186, Mexico, D. F.
Secretary: Dr. Fernando López Clares, Medellín 191, Mexico, D. F.

SOCIÉTÉ DE PÉDIATRIE DE PARIS

President: Dr. B. Weill-Hallé, 49 Avenue Raymond Poincaré, Paris, France.
Secretary: Dr. Jean Hallé, 10 bis Rue du Pré aux Clercs, Paris, France.
Place: Hôpital des Enfants Malades, 49 Rue de Sèvres. Time: 4:30 p. m., third Thursday of every month.

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SCIENTIFIC ASSEMBLY, SECTION ON PEDIATRICS

Chairman: Dr. Julius H. Hess, 104 S. Michigan Ave., Chicago.
Secretary: Dr. Hugh L. Dwyer, 315 Alameda Rd., Kansas City, Mo.
Place: Cleveland.

AMERICAN ACADEMY OF PEDIATRICS

President: Dr. J. B. Bilderback, 1020 S. W. Taylor St., Portland, Ore.
Secretary: Dr. Clifford G. Grulee, 636 Church St., Evanston, Ill.
Place: Hotel Peabody, Memphis, Tenn. Time: Nov. 18-20, 1940.
Region I. Place: New Haven, Conn. Time: March 27-29, 1941.
Region II. Place: Richmond, Va.
Region III. Place: Palmer House, Chicago. Time: May 15-17, 1941.
Region IV. Place: San Francisco.

NORTHERN CALIFORNIA AFFILIATES

President: Dr. Crawford Bost, 490 Post St., San Francisco.
Secretary: Dr. William A. Reilly, 384 Post St., San Francisco.
Time: Second Thursday of September, November, January, March and May.

AMERICAN HOSPITAL ASSOCIATION, CHILDREN'S HOSPITAL SECTION

Chairman: Dr. D. L. Richardson, 593 Eddy St., Providence, R. I.
Secretary: Dr. Joelle C. Hiebert, 299 Main St., Lewiston, Maine.

AMERICAN PEDIATRIC SOCIETY

President: Dr. Thomas B. Cooley, 1728 Seminole Ave., Detroit.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Place: Hot Springs, Va. Time: May 22-24, 1941.

CANADIAN SOCIETY FOR THE STUDY OF DISEASES OF CHILDREN

President: Dr. L. M. Lindsay, 815 Medical Arts Bldg., Montreal.
Secretary-Treasurer: Dr. Elizabeth Chant Robertson, Hospital for Sick Children, Toronto.

Society for Pediatric Research

President: Dr. A. Ashley Weech, 3975 Broadway, New York.
Secretary: Dr. Mitchell I. Rubin, 1740 Bainbridge St., Philadelphia.

SECTIONAL

Intermountain Pediatric Society

President: Dr. Eugene Smith, 385–24th St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 837 Boston Bldg., Salt Lake City.
Place: Salt Lake City General Hospital. Time: First Thursday of each month, 8 p. m.

New England Pediatric Society

President: Dr. R. Cannon Eley, 319 Longwood Ave., Boston.
Secretary-Treasurer: Dr. James Marvin Baty, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

North Pacific Pediatric Society

President: Dr. S. G. Henricke, 4215 N. E. Hancock St., Portland, Ore.
Secretary: Dr. J. S. Backstrand, 333 Wyatt Court, Salem, Ore.

Rocky Mountain Pediatric Society

President: Dr. Donn Barber, 802½–8th Ave., Greeley, Colo.
Secretary: Dr. Kenneth Schmidt, Republic Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7:30 p. m.

Southern Medical Association, Section of Pediatrics

Chairman: Dr. Harvey F. Garrison, 319 E. Capitol St., Jackson, Miss.
Secretary: Dr. Warren W. Quillian, 227 Aragon Ave., Coral Gables, Fla.
Place: Louisville Ky. Time: Nov. 12-15, 1940.

STATE

Alabama Pediatric Society

President: Dr. Stewart H. Welch, 1117 S. 20th St., Birmingham.
Secretary-Treasurer: Dr. William R. Britton, 4 Catoma St., Montgomery.
Place: Birmingham. Time: Sept. 18, 1940.

Arkansas State Pediatric Association

Chairman: Dr. C. B. Billingsley, 1425 N. 11th St., Fort Smith.
Secretary: Dr. R. E. Weddington, 1425 N. 11th St., Fort Smith.

California State Medical Society, Section on Pediatrics

Chairman: Dr. William Belford, 233 A St., San Diego.
Secretary: Dr. Louis M. Earle, 6381 Hollywood, Hollywood, Calif.
Place: Del Monte. Time: May 1941.

Florida State Pediatric Society

President: Dr. Warren W. Quillian, 227 Aragon Ave., Coral Gables.
Secretary: Dr. George N. Leonard, 605 Lincoln Rd., Miami Beach.
Place: Concurrent with state association meeting at time of convention.

Georgia Pediatric Society

President: Dr. R. C. McGahee, 1345 Greene St., Augusta.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St. N. E., Atlanta.

Hezekiah Beardsley Pediatric Club of Connecticut

President: Dr. Oliver L. Stringfield, 1416 Bedford St., Stamford.
Secretary: Dr. Joseph L. Hetzel, 103 N. Main St., Waterbury.
Time: Three meetings a year.

Illinois State Medical Society, Section on Pediatrics

Chairman: Dr. Orville Barbour, 331 Fulton St., Peoria.
Secretary: Dr. Craig Butler, 715 Lake St., Oak Park.
Place: Chicago. Time: May 1941.

Indiana State Pediatric Society

President: Dr. K. T. Knode, 1105 E. Jefferson Blvd., South Bend.
Secretary-Treasurer: Dr. Mathew Winters, 621 Hume Mansur Bldg., Indianapolis.
Time: Two meetings a year.

Iowa Pediatric Society

President: Dr. Morgan J. Foster, 837 Higley Bldg., Cedar Rapids.
Secretary-Treasurer: Dr. Arnold M. Smythe, 406–6th Ave., Des Moines.

Louisiana State Pediatric Society

President: Dr. H. Aubrey White, Alexandria.
Secretary-Treasurer: Dr. W. C. Rivenbark, 3503 Prytania St., New Orleans.
Place: Shreveport. Time: April 1941.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. Norman L. Hawkins, 11 Public Sq., Watertown, N. Y.
Secretary: Dr. William J. Orr, 135 Linwood Ave., Buffalo.

Medical Society of the State of Pennsylvania, Pediatric Section

Chairman: Dr. Ralph M. Tyson, 255 S. 17th St., Philadelphia.
Secretary: Dr. John D. Sturgeon Jr., 22 N. Gallatin Ave., Uniontown.
Place: Philadelphia, Pa. Time: Sept. 30-Oct. 3, 1940.

Michigan State Medical Society, Pediatric Section

President: Dr. Ward L. Chadwick, 524 Medical Arts Bldg., Grand Rapids.
Chairman: Dr. Harry Towsley, University of Michigan Hospital, Ann Arbor.
Place: Detroit. Time: Sept. 25-27, 1940.

Mississippi State Pediatric Society

President: Dr. Guy C. Jarratt, 920 Crawford St., Vicksburg.
Secretary-Treasurer: Dr. Harvey F. Garrison Jr., 315 E. Capitol Pl., Jackson.
Place: To be designated by society. Time: Yearly.

Nebraska Pediatric Society

President: Dr. Herman M. Jahr, 1120 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. Elmer W. Bantin, 440 Aquila Court Bldg., Omaha.
Place: As announced by committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

North Carolina Pediatric Society

President: Dr. Marion Y. Keith, 369 N. Elm St., Greensboro.
Secretary: Dr. G. W. Kutscher Jr., 176 Woodfin St., Asheville.

Oklahoma State Pediatric Society

President: Dr. Ben H. Nicholson, 301 N.W. 12th St., Oklahoma City.
Secretary: Dr. Luvern Hays, 108 W. 6th St., Tulsa.
Place: Oklahoma Club. Time: 6:30 p. m., fourth Friday of each alternate month from September to May, inclusive.

South Carolina Pediatric Society

President: Dr. R. B. Josey, 1517 Hampton Ave., Columbia.
Secretary-Treasurer: Dr. Wilson Ball, South Carolina State Health Dept., Columbia.

Tennessee State Pediatric Society

President: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.
Secretary: Dr. Gilbert Eblen, 607 Medical Arts Bldg., Knoxville.

Texas Pediatric Society

President: Dr. C. P. Jasperson, 509 Nixon Bldg., Corpus Christi.
Secretary-Treasurer: Dr. F. H. Lancaster, 4409 Fannin St., Houston.
Place: Galveston. Time: Oct. 5, 1940.

Virginia Pediatric Society

President: Dr. S. A. Anderson Jr., 2326 W. Grace St., Richmond.
Secretary: Dr. John M. Bishop, 511 Medical Arts Bldg., Roanoke.
Place: White Sulphur Springs, W. Va. Time: July 24, 1940.

West Virginia State Medical Society, Section on Pediatrics

President: Dr. Raymond Sloan, 1139–4th Ave., Huntington.
Secretary: Dr. Thomas G. Folsom, 1139–4th Ave., Huntington.
Place: White Sulphur Springs. Time: July 29-31, 1940.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. J. D. Nourse, 10515 Carnegie Ave., Cleveland.
Secretary: Dr. I. B. Silber, 10465 Carnegie Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. T. B. Verner, 170 St. George St., Toronto, Canada.
Secretary: Dr. D. V. Hutton, 170 St. George St., Toronto, Canada.

Bronx Pediatric Society

President: Dr. Harry S. Altman, 940 Grand Concourse, New York.
Secretary: Dr. David Zahn, 2474 Valentine Ave., New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

Brooklyn Academy of Pediatrics

President: Dr. Archibald Smith, Garden City, N. Y.
Secretary: Dr. Walter Coles, 604–2d St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, July, August and September.

Central New York Pediatric Club

President: Dr. Frank van der Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Third Tuesday of April and September.

Chicago Pediatric Society

President: Dr. Gerard N. Krost, 2376 E. 71st St., Chicago.
Secretary: Dr. George F. Munns, 723 Elm St., Winnetka, Ill.
Place: Children's Memorial Hospital, 710 Fullerton Ave. Time: Third Tuesday of each month, October to May, inclusive.

Dallas Pediatric Society

President: Dr. Edgar Loomis, 351 W. Jefferson Ave., Dallas, Texas.
Secretary-Treasurer: Dr. John E. Ashby, 3610 Fairmont Ave., Dallas, Texas.
Place: Bradford Baby Hospital. Time: 1 p. m., second and fourth Saturdays of each month.

Detroit Pediatric Society

President: Dr. Robert J. Mason, Birmingham, Mich.
Secretary: Dr. J. Hugh Lewis, 2966 Biddle, Wyandotte, Mich.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Stephen C. Redd, 157 Forrest Ave. N. E., Atlanta.
Secretary: Dr. C. Dixon Fowler, Medical Arts Bldg., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Houston Pediatric Society

President: Dr. Thomas J. Donovan, 3820 Fannin St., Houston, Texas.
Secretary: Dr. Raymond Cohen, 2300 Caroline St., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

Kansas City (Missouri) Pediatric Society

President: Dr. John Aull, 1103 Grand Ave., Kansas City.
Secretary: Dr. George Herrman, 1107 Bryant Bldg., Kansas City.
Place: Kansas City General Hospital. Time: On call.

Los Angeles County Medical Association, Pediatric Section

President: Dr. Alonzo Cass, 1908 Wilshire Blvd., Los Angeles.
Secretary-Treasurer: Dr. Gladys Patric Shahovitch, 3936 Roderick Rd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd. Time: Second Monday of February, April, June, October and December.

MEDICAL SOCIETY OF THE COUNTY OF KINGS AND THE ACADEMY OF MEDICINE OF BROOKLYN, PEDIATRIC SECTION

President: Dr. Sydney Nussbaum, 247 Ocean View Ave., Brooklyn.
Secretary: Dr. Harry Bikoff, 850 St. Marks Ave., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: 9:00 p. m., second Monday of each month, October to March, inclusive.

MEDICAL SOCIETY OF THE COUNTY OF QUEENS, INC., SECTION ON PEDIATRICS

Chairman: Dr. A. A. Trivilino, 88-07–150th St., Jamaica, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144–38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May.

MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA, SECTION ON PEDIATRICS

President: Dr. Harry A. Ong, 1801 I St. N. W., Washington, D. C.
Secretary-Treasurer: Dr. William F. Burdick, 5402 Connecticut Ave. N. W., Washington, D. C.
Place: Medical Society Bldg., 1718 M St. N. W. Time: 8 p. m., fourth Thursday of every month.

MEMPHIS PEDIATRIC SOCIETY

President: Dr. E. C. Mitchell, 1073 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. Harry Jacobson, 1193 Madison Ave., Memphis, Tenn.
Place: John Gaston Hospital. Time: Quarterly.

MILWAUKEE PEDIATRIC SOCIETY

President: Dr. S. F. Morgan, 2577 N. Downer Ave., Milwaukee.
Secretary-Treasurer: Dr. F. R. Janney, 1411 Wauwatosa Ave., Wauwatosa, Wis.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Chairman: Dr. Leslie O. Ashton, 850 Park Ave., New York.
Secretary: Dr. Alfred Langmann, 108 E. 68th St., New York.
Place: New York Academy of Medicine, 2 E. 103 St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. Roland E. Nutting, 205 W. 2d St., Duluth, Minn.
Secretary-Treasurer: Dr. John M. Adams, 1009 Nicollet Ave., Minneapolis.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

OKLAHOMA CITY PEDIATRIC SOCIETY

President: Dr. J. Byron Snow, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. G. R. Felts, 1200 N. Walker St., Oklahoma City.
Place: Oklahoma Club. Time: Third Friday of each alternate month.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Pascal F. Lucchesi, 4000 N. Front St., Philadelphia.
Secretary: Dr. Aims C. McGuinness, Children's Hospital, 1740 Bainbridge St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to April, inclusive.

Pittsburgh Pediatric Society

President: Dr. E. L. Piper, 3200–5th Ave., Pittsburgh.
Secretary-Treasurer: Dr. Carl Ruder, 646 Washington Rd., Mount Lebanon, Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate month from October to June, inclusive.

Richmond Pediatric Society

President: Dr. Charles L. Outland, 312 N. 9th St., Richmond, Va.
Secretary-Treasurer: Dr. T. Stanley Meade, 913 Floyd Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: 8 p. m., third Thursday of each month, except June, July and August.

Rochester Pediatric Society

President: Dr. David Wolin, 16 N. Goodman St., Rochester, N. Y.
Secretary: Dr. W. L. Bradford, 16 N. Goodman St., Rochester, N. Y.
Place: Rochester Academy of Medicine or arrangement by program committee. Time: Third Friday of each month from October to May.

St. Louis Pediatric Society

President: Dr. Max Deutch, 634 N. Grand Blvd., St. Louis.
Secretary-Treasurer: Dr. Peter G. Danis, 634 N. Grand Blvd., St. Louis.
Place: St. Louis Medical Society Bldg. Time: First Friday of each month from October to June.

Seattle Pediatric Society

President: Dr. Jay I. Durand, 1305–4th Ave., Seattle.
Secretary: Dr. Frederick B. Joy, 1215–4th Ave., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

Southwestern Pediatric Society

President: Dr. Norman Nixon, 1136 W. 6th St., Los Angeles.
Secretary: Dr. Donald C. Shelby, 3780 Wilshire Blvd., Los Angeles.
Place: Jonathan Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Mark Osterlin, Central Michigan Children's Clinic, Traverse City, Mich.
Secretary: Dr. D. Murray Cowie, University of Michigan, Ann Arbor, Mich.
Time: Nov. 15-16, 1940.

Westchester County Medical Society, Pediatric Section (New York)

President: Dr. M. Bernard Brahdy, 531 E. Lincoln Ave., Mount Vernon.
Secretary-Treasurer: Dr. Elvira Ostlund, 64 Highland Ave., Rye.
Place: Grasslands Hospital, Valhalla, N. Y. Time: Third Thursday in October, December, February and April.